7.0 Selected Long-Term Control Plan

Contents:

7.1 Introduction

This section describes the CSO Long-term Control Plan (LTCP) Indianapolis has selected. The selected plan is based on the alternatives evaluation described in Section 4, the public input described in Section 5, and the financial impacts and affordability analysis discussed in Section 6. The text, tables and figures that follow summarize the results of the city's evaluation and the selection of the long-term control plan.

7.2 Selection of Plan

Section 4 described the three systemwide CSO control plans that have been evaluated by the city. CSO Control Plan 1, which consists of storage and conveyance in all watersheds and Advanced Wastewater Treatment (AWT) plant improvements, is the most cost-effective plan, provides the best performance on neighborhood issues and operability, and also achieves the greatest reduction in biological oxygen demand (BOD). Plan 1 also was the public's preferred plan, as described in Section 5.8. For these and other reasons, the city, U.S. EPA and the Indiana Department of Environmental Management (IDEM) agreed that CSO Control Plan 1 is the best solution for the City of Indianapolis. This subsection describes how the city evaluated and selected the level of control for CSO Control Plan 1.

7.2.1 Selection Factors

As noted earlier in Section 1.5.2, the city is seeking to restore beneficial uses and protect streams from CSO discharges when people are most likely to use them. Other goals include controlling solids and floatables, capturing "first flush" discharges, and meeting state and federal aquatic life requirements for dissolved oxygen. In selecting the correct level of control, the city also took the following factors into consideration:

- Restoring Attainable Uses
- Cost-Effectiveness
- Public Acceptance
- Affordability

Section 4.6.4.1 describes the cost-effectiveness of each plan in detail. The city considered a range of parameters to evaluate the cost-effectiveness of each level of control. The following comparisons are presented in this report:

- Present worth cost vs. percent capture
- Present worth cost vs. days per year with *E. coli* bacteria over 235 cfu/100 mL
- Present worth cost vs. days per year with *E. coli* bacteria over 10,000 cfu/100 mL
- Cost per gallon of CSO captured
- Cost per pound of BOD removed
- Cost per unit *E. coli* bacteria removed

7.2.2 Evaluation of Short-listed Alternatives

The city initially evaluated CSO Control Plan 1 at the following levels of control: 90, 93, 95, 97 and 99 percent capture. The level of control is a systemwide average for all watersheds. U.S. EPA proposed an additional level of control: 96 percent capture on White River, Pleasant Run, and Eagle Creek, and 97 percent capture on Fall Creek and Pogues Run. This proposal was based on the perceived relatively low cost per gallon to achieve higher levels of control on Fall Creek and Pogues Run. The present worth cost of U.S. EPA's 96/97 percent plan would be $2.05 billion.

U.S. EPA and IDEM also requested the evaluation of higher levels of capture on tributary watersheds while maintaining 93 percent capture on the White River. The evaluation determined that maintaining a lower level of control on the White River would not significantly reduce program costs, and the alternative was not carried forward for public comment or detailed technical review.

Finally, U.S. EPA asked the city to consider a plan that would achieve 97 percent capture on Fall Creek and 95 percent capture on other watersheds, again due to the cost-effectiveness of achieving higher capture on Fall Creek. The present worth capital and operation/maintenance cost of the 97/95 percent capture plan would be $1.73 billion. This increased level of capture does not result in additional uses above the 95 percent level of control.

Cost-Effectiveness: The optimal point in the evaluation of cost-effectiveness is referred to as the "knee of the curve," which is the point where an alternative transitions from increasing to decreasing benefit for each additional dollar spent. When presented graphically, the "knee of the curve" is the point where the slope of the curve is changing from shallow to steep. As presented in Section 4.6.4.1, the city has determined that the knee of the curve for most comparisons described above is at the 95 percent capture level of control. However, on Fall Creek the city has determined that the knee of the curve falls closer to the 97 percent capture level of control.

Although the 97/95 percent capture level of control does not meet Indiana's current recreational water quality standards, further CSO control would not restore additional uses.

Public Acceptance: Section 5.8 describes the city's 2004 public outreach activities to present the three CSO control plan options to the public. The outreach included watershed meetings, neighborhood meetings, mailing of a 12-page newsletter and comment card, information on the city's Web site, and various presentations to the news media. As part of the outreach, members of the public were asked to rank neighborhood issues and cost and benefit factors. As summarized in Section 5.8.3, citizens who responded preferred the 95 percent capture level of control.

In addition, when asked whether the city should spend more resources and place higher standards on some streams than others, the public response was mixed. The largest number of residents (38 percent) wanted to treat all streams equally. However, a significant number of respondents favored putting a higher priority on some streams than others, based on different distinguishing factors.

Affordability: As summarized in Section 6.5, implementing the long-term control plan will place a significant financial and economic burden on the City of Indianapolis. During the next 20 years, the city's wastewater revenue requirements are expected to increase by about 12 percent per year, on average. This will significantly impact industrial, commercial and residential sewer rates. The city is particularly concerned about the ability of financially disadvantaged residents in Center Township and those living below the poverty level to afford sewer service. Based upon U.S. EPA guidance, the city's calculation of the residential burden for the retail service area will reach the medium burden category. In Center Township and for people living below poverty level, the burden will fall into the high burden category.

Because it is unclear that the city will be able to sustain this level of increases over the long term, this LTCP proposes the following adaptive approach to address the costs and schedule:

1) Commitment to the first 14 CSO control measures listed in Table 7-5 (which are not dependent upon a revision to water quality standards);

2) Pursuit of grant funds and low-interest loans to minimize the economic impact; and

3) Re-assessment of the capital program and rates every 3-5 years. If the cost of the CSO long-term control plan exceeds $2.325 billion, seek an extension of the implementation schedule.

The city also is concerned about other key factors affecting the program's cost and the financial capability of Indianapolis residents and businesses. These factors include the competition for specialized construction and labor resources during the LTCP implementation period, unemployment rates and the loss of professional and manufacturing jobs, affordable housing, bond ratings, property tax reassessments, property foreclosures and bankruptcies.

7.2.3 Selected CSO LTCP

The city has selected an LTCP that would achieve 97 percent capture on Fall Creek and 95 percent capture on other waterways. The selected plan is expected to reduce the average annual overflow frequency from 60 storms per year to approximately two storms per year on Fall Creek and four storms per year on other waterways, based on average rainfall statistics for Indianapolis. This is a very high level of CSO control that will achieve many benefits to Indianapolis neighborhoods, waterways and quality of life. The elements of the selected plan are summarized in Section 7.3, and the benefits of the plan are discussed in Section 7.4.

7.3 CSO Control Measures

7.3.1 Summary of Systemwide Control Measures

The selected plan will employ storage/conveyance facilities in all major watersheds combined with advanced wastewater treatment plant improvements. Facilities will be designed to achieve 97 percent capture on Fall Creek and 95 percent capture on White River, Pleasant Run/Bean Creek, Pogues Run and Eagle Creek. Sewer separation will be employed along Lick Creek, State Ditch and other isolated outfall locations. The selected plan is illustrated in **Figure 7-1**.

The selected plan will collect flow from outfalls on a regional basis using conveyance facilities connected to a single deep tunnel. The deep tunnel will serve primarily as a storage facility, and the stored flows will be pumped out to the AWT plants at the end of a storm event. The AWT facilities will be expanded and upgraded to provide treatment of wet-weather flows. The plan also includes near-surface collection conduits and satellite near-surface storage facilities to control remotely located outfalls on upper White River and Pogues Run.

The key features of the selected plan are:

- Central tunnel system along Fall Creek and the White River, with a pumping facility located near the Southwest Diversion Structure
- Collection interceptor for remote outfalls along Fall Creek and the White River to convey wet-weather flows into the central tunnel system
- Satellite storage facilities for remotely located outfalls along upper White River and upper Pogues Run

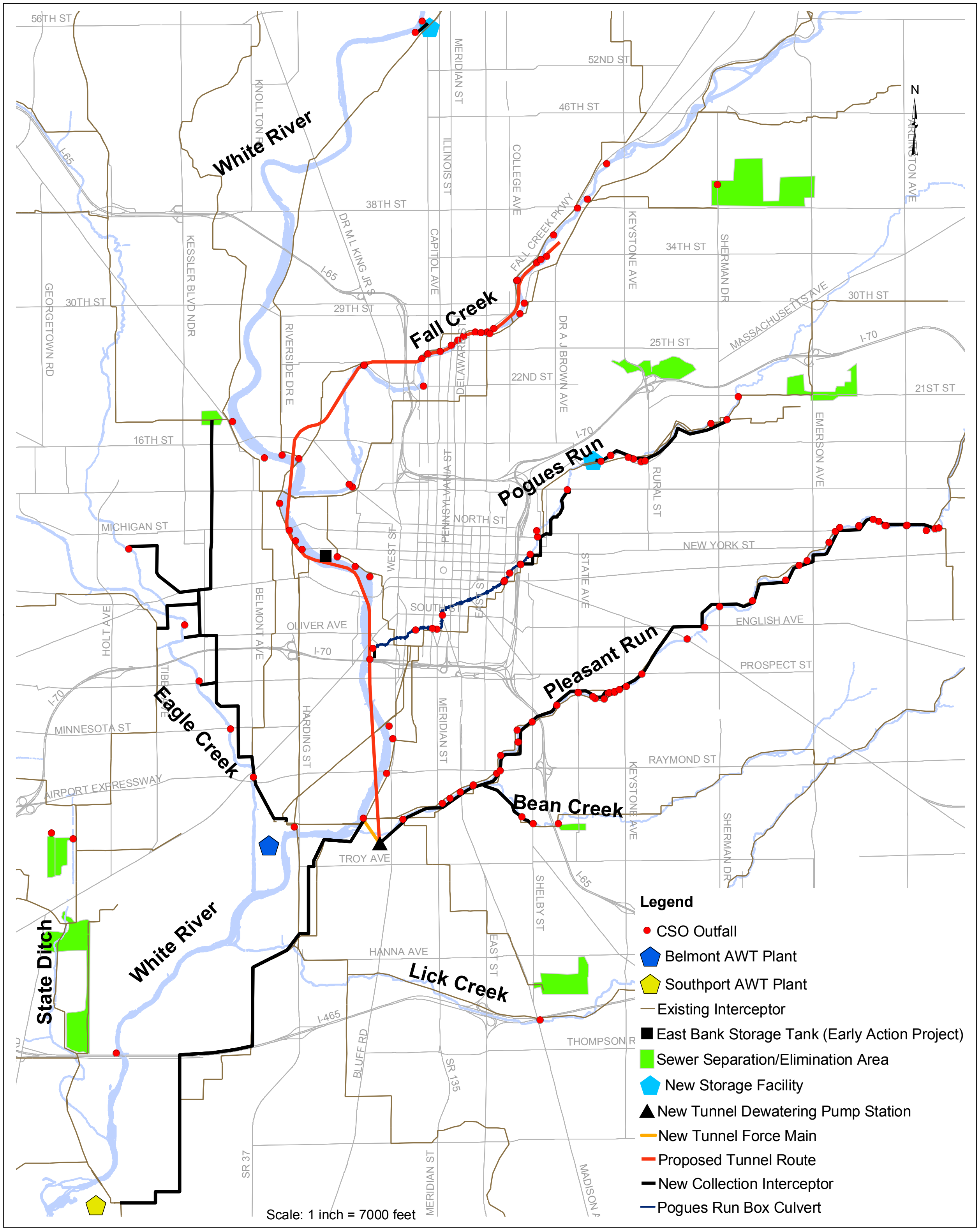


Figure 7-1
Systemwide Selected CSO Plan

- Collection interceptors along Pogues Run, Pleasant Run and Bean Creek to convey wet-weather flows into the central tunnel system
- Collection interceptor along Eagle Creek to convey wet-weather flows to the Belmont AWT plant
- An interplant connection interceptor from the Southwest Diversion Structure to the Southport AWT plant to convey stored tunnel flows to the Southport plant for treatment
- Local sewer separation projects to eliminate isolated overflows on State Ditch, Lick Creek, White River and the upstream ends of Fall Creek, Pogues Run and Bean Creek
- Belmont AWT plant improvements
- Southport AWT plant improvements
- Early action projects described below and in Section 4.6.1.4.
- Watershed improvements, as described in Section 4.6.1.5, will be implemented at the city's discretion.

7.3.1.1 Early Action Projects

Beginning in 1995, the city instituted a number of early action projects to reduce combined sewer overflow frequency and volume in a number of watersheds. These projects were accelerated in 2001 after completion and submittal of the city's initial long-term control plan to U.S. EPA and IDEM. Early action projects have been incorporated into the city's cost estimates, projected benefits and implementation schedule for the long-term control plan. A partial list of those projects includes:

- Major combined sewer improvement and rehabilitation projects from 1995 to 2002
- In-system storage projects at CSOs 063, 063A and 065
- In-system storage at CSOs 080, 084, 118, 053, 058, and 101, with real-time controls to be added at a later date
- Re-routing of CSO 205 on White River to Lift Station 507 and modifications to Lift Station 507 to eliminate CSOs 205 and 156 on White River
- Elimination of CSO 103 on Fall Creek, CSOs 217 and 218 on State Ditch, CSO 275 on White River and CSO 235 on Lick Creek
- Belmont West cut-off sewer project
- East Bank storage tank to mitigate overflows at CSO 039 along the White River
- Consolidation sewer at CSOs 034/035 and conversion of half of Pogues Run conduit to CSO storage tunnel
- Vortex separator pilot project at CSO 045 on White River
- Interceptor capacity improvement projects in all watersheds
- Pogues Run flood control basin and wetlands
- Flow equalization basins, Belmont storage basin, raw sewage pumping, and other Belmont and Southport AWT plant improvements
- Screens at CSOs 62 and 135

7.3.1.2 Program Costs

Table 7-1 (LTCP Project Costs by Watershed) lists the components by watershed, as well as the estimated capital, operation and maintenance and program costs associated with the LTCP. The total present worth cost of the selected LTCP is estimated to be $1.73 billion over its 20-year implementation period. Watershed projects are estimated with a present worth cost of an additional $64.3 million. Design and performance criteria and project schedule are described later in Section 7.5.

7.3.2 Fall Creek Control Measures

The Fall Creek watershed required a careful examination of unique hydrological dynamics and citizen preferences for addressing CSO issues in the stream. The selected plan for Fall Creek cost-effectively maximizes capture of CSO flows through construction of an underground storage tunnel and associated collection sewers.

Because groundwater is such an important resource for the City of Indianapolis, the city will take all necessary steps to prevent groundwater contamination during construction and operation of the deep tunnel along Fall Creek and White River. The city's Groundwater Management Plan includes the following components: 1) reviewing available groundwater data to evaluate where groundwater impacts might occur along the preliminary tunnel alignments; 2) developing a calibrated groundwater model to evaluate alternatives for tunnel construction in the bedrock; 3) developing a groundwater risk registry and mitigation controls to be considered during construction and future operation; and 4) reviewing specialized construction techniques to protect groundwater. The plan also includes information on recommended groundwater monitoring both during and after tunnel construction to verify groundwater protection.

Although not a required component of the LTCP, the city also intends to implement the supplemental non-CSO watershed improvements of dam removal, stream aeration and flow augmentation to provide additional benefits to water quality, aquatic life and aesthetics during both dry and wet weather. The city will implement the following CSO control measures:

- **In-System Storage:** Construction of three inflatable dams at CSOs 063, 063A and 065. This is an early action project.
- **Tunnel and Collector Pipes:** A deep tunnel will be constructed along Fall Creek to store and convey captured CSO flows. The White River and Fall Creek Tunnel will begin near 34th Street and Sutherland Avenue and will

Table 7-1
LTCP Component Costs by Watershed

	Capital Cost (millions)
Fall Creek	
Fall Creek Tunnel and Collector Pipes	
Storage Tunnel	$ 199.4
Collector Pipes	$ 14.3
Removal of Boulevard Dam	$ 0.7
In-System Storage at CSOs 063, 063A and 065*	$ 3.4
CSO 103 Rehabilitation*	$ 0.5
CSO Pilot Project - Inflatable Dam at CSO 053*	$ 0.4
CSO Pilot Project - Net at CSO 135 and sluice gate at CSO 058*	$ 0.3
Fall Creek Netting at CSO 062*	$ 0.8
Fall Creek and Indy Interceptor Capacity*	$ 3.0
Eliminate SSO 105* and SSO 124	$ 6.1
FALL CREEK TOTAL COSTS	$ 229.0
Pogues Run	
Upper Pogues Run Improvements	
Upper Pogues Run Collection Interceptor	$ 9.5
Off-line Storage Facility (Spades Park)	$ 55.7
Lower Pogues Run Improvements	
*Pogues Run Tunnel Conversion**	$ 20.4
Lower Pogues Run Regulator Modifications	$ 3.7
In-Line Storage at CSO 101*	$ 1.2
Consolidation of 034 and 035 Outfalls*	$ 19.1
Sewer Separation at CSO 143	$ 36.7
Pogues Run Wetlands*	$ 15.0
POGUES RUN TOTAL COSTS	$ 161.2
Pleasant Run	
Pleasant Run Interceptor, (CSO Collector Pipe)	
Pleasant Run Collection Interceptor	$ 117.0
Pleasant Run Industrial Flow Interceptor	$ 2.0
Bean Creek Collection Interceptor	$ 1.9
Sewer Separation at CSO 017	$ 3.5
CSO Pilot Project - Inline netting at CSO 149*	$ 0.2
PLEASANT RUN TOTAL COSTS	$ 124.6
Eagle Creek	
Eagle Creek Interceptor (CSO Collector Pipe)	
Collection Interceptor to Belmont WWTP	$ 29.9
*West Belmont Cut-off Sewer Project**	$ 17.9
EAGLE CREEK TOTAL COSTS	$ 47.8

Table 7-1
LTCP Component Costs by Watershed - Continued

	Capital Cost (millions)
Lick Creek and State Ditch	
Sewer Separation at CSO 235*	$ 0.2
Sewer Separation at CSOs 217 and 218*	$ 3.1
LICK CREEK AND STATE DITCH TOTAL COSTS	$ 3.3
White River	
Central Tunnel and Pump Station	
Storage Tunnel	$ 106.3
Dewatering Pump Station	$ 74.0
Collection Sewers	$ 116.2
Sewer Separation at CSO 046	$ 5.7
Permanent Aeration Upstream of Perry K Chevy Dam	$ 2.8
Stout Dam Modification	$ 1.9
Riviera Club CSO Abatement	$ 26.9
Rerouting of CSO 205 to Lift Station No. 507*	$ 1.3
Modifications to Lift Station No. 507 (Elimination of CSO 156)*	$ 0.3
White River Overflow Storage and Primary Treatment (East Bank)*	$ 5.9
Sewer Separation at CSO 275*	$ 1.4
White River Screen at CSO 039*	$ 0.6
Additional Barrel Harding/White River Inverted Siphon*	$ 1.3
Siphon at 10th and White River	$ 2.0
CSO Pilot Project - Vortex at CSO 045*	$ 1.2
WHITE RIVER TOTAL COSTS	$ 347.9
Advanced Wastewater Treatment Plants	
Belmont AWT Plant	
Belmont Gravity Belt Thickeners*	$ 6.0
Trickling Filters / Solids Contact (new aeration tanks and intermediate clarifiers)	$ 84.2
*Belmont Bio-Roughing System Clarification Pilot Study**	$ 0.8
Wet-weather Chlorine Disinfection Tank and Retrofit of Existing Outfall	$ 12.2
Belmont AWT Improvements	
New Headworks Facility with Screens	$ 36.4
New Grit Removal Facility with Flow Split	$ 8.3
*Wet-Weather Storage Basins and Primary Clarifiers**	$ 27.8
Yard Piping and Valves	$ 10.6
Belmont Septage Receiving Area Pumping Station*	$ 3.8
Belmont Vacuum-Swing Adsorption (VSA) Expansion & Ozonation Rehabilitation*	$ 21.3
Pre-aeration to Primary Clarifier Conversion at Belmont AWT Plant*	$ 3.5
Restore Pump Bypass to Southport AWT Plant*	$ 1.3
BELMONT AWT PLANT TOTAL COSTS	$ 216.3

Table 7-1
LTCP Component Costs by Watershed - Continued

	Capital Cost (millions)	
Southport AWT Plant		
Southport AWT Improvements		
New 350-mgd Headworks EPC & Wet-Weather Pumping	$	55.1
New 350-mgd Grit Removal Facility	$	12.9
New 125-mgd/275-mgd Primary Clarifiers (125,000 sf)	$	48.8
New Air Nitrification System (ANS) Aeration Equipment	$	7.5
New ANS Return Activated Sludge (RAS) Pumping	$	5.6
New ANS Final Clarifiers	$	51.5
New 150-mgd Final Effluent Pump Station	$	5.7
New 15 MG Secondary Equalization Basin	$	5.3
Add Supplemental Disinfection Process (chlorination /dechlorination)	$	6.8
New 75 MGD CSO Pump Station	$	15.7
New 75 MGD EHRC	$	29.3
Yard Piping and Valves	$	8.5
*Southport Sludge Lagoon Conversion**	$	3.4
SOUTHPORT AWT PLANT TOTAL COSTS	$	255.9
Interplant Connection		
Interplant Connection Interceptor	$	131.7
INTERPLANT CONNECTION TOTAL COSTS	$	131.7
Systemwide Projects		
Real Time Controls (Phase I and II)*	$	7.9
Combined Sewer Improvements 2001*	$	4.8
1995 CSO Operational Plan Phase I*	$	0.9
Miscellaneous Rehabilitation projects in 2002*	$	1.1
SYSTEMWIDE PROJECT TOTAL COSTS	$	14.7
LTCP Implementation Costs	$	95.5
TOTAL CAPITAL COST (LTCP PROGRAM COST)	**$**	**1,628.0**
Systemwide Present Worth Operations and Maintenance Costs	$	100.3
Total Present Worth Cost in 2004 dollars (LTCP)	**$**	**1,728.3**
Watershed Projects		
Accelerated Septic System Conversion Program	$	30.5
Temporary Aeration in Fall Creek and White River	$	0.4
Streambank Restoration	$	3.8
Flow Augmentation for Fall Creek, Pogues Run, Pleasant Run	$	26.0
TOTAL CAPITAL COST (WATERSHED PROJECT COST)	**$**	**60.6**
Watershed Project Present Worth Operations and Maintenance Costs	$	3.7
Total Present Worth Cost in 2004 dollars (Watershed Projects)	**$**	**64.3**
Total Present Worth Cost in 2004 dollars (LTCP with Watershed Projects)	**$**	**1,792.6**

Notes:
*Early Action Project
All costs are expressed in 2004 dollars. Projects highlighted in gray are not listed in Table 7-5.

generally run parallel to Fall Creek in a southwesterly direction, connecting to the White River tunnel to create a single continuous underground storage facility. The proposed alignment of the tunnel (shown in **Figure 7-2**) has been modified from the original Plan 1 configuration, shown in Section 4.5.2, to reflect more recent facility planning conducted by the city in late 2004 and early 2005. Additional collection sewers or near-surface tunnels will be required to group CSOs along the Fall Creek deep tunnel and direct them to the deep tunnel.

At the city's discretion, the following non-CSO projects may be implemented as needed to improve water quality:

- **Dam Removal:** Eliminating Boulevard Dam is expected to help moderate the dissolved oxygen problems observed in Fall Creek upstream of the dam.
- **Aeration:** An in-stream fountain is planned west of the Meridian Street Bridge on Fall Creek to increase dissolved oxygen levels during low-flow summer months. Portable aeration equipment may be used as needed during low-flow conditions prior to the installation of the in-stream fountain.
- **Flow augmentation:** Fall Creek would benefit from a minimum of 2.5 mgd of flow augmentation to maintain bacteria compliance during dry-weather, low-flow conditions. The city may construct an effluent reuse force main to discharge treated wastewater from the Belmont AWT plant into the upper CSO reaches of Fall Creek. This plan is dependent upon permitting authorities not requiring additional treatment to discharge AWT plant effluent to Fall Creek. Other flow augmentation or effluent reuse alternatives may be considered during facility planning and public outreach. This solution will be reviewed periodically to determine whether there are other technologies or methods for maintaining recreational standards during dry-weather, low-flow conditions.
- **Early Action Projects:** Several early action projects, including rehabilitation of sewers to eliminate CSO 103, inflatable dam at CSO 053, netting at CSOs 135 and 062, automatic sluice gate at CSO 058, elimination of SSOs 105 and 124 and interceptor capacity improvements.

Figure 7-2 shows the approximate location and alignment of the Fall Creek control measures. Final facility locations and sewer alignments will be developed during facility planning and design.

7.3.3 Pogues Run Control Measures

Indianapolis has aggressively addressed urban flooding and CSO impacts along Pogues Run, with several control measures along the stream already constructed. The selected plan for Pogues Run will complement existing control measures to improve the quality of Pogues Run and to convey CSO discharges away from areas such as schools and parks. The city's plan includes the following CSO control measures on Pogues Run:

- **In-Line Storage at CSO 101:** As part of its early action projects, the city has constructed an inflatable dam with real-time controls at CSO 101 to reduce overflows in Brookside Park.
- **Consolidation of 034/035 Outfalls:** Overflows from CSOs 136, 034, 034A and 035 will be consolidated and rerouted away from four local schools to the Pogues Run Tunnel, described below. This project is under construction.
- **Lower Pogues Run Improvements:** The lower portion of Pogues Run is enclosed in an underground, double-barrel conduit, known as the Pogues Run Tunnel, which extends under downtown Indianapolis for approximately 2.2 river-miles. One of the two underground conduits will be converted to store and convey captured CSO flows from outfalls 034/035 to the central tunnel. Rehabilitation of the 35-inch Dorman Street combined sewer will serve as protection for CSO 034/035 tunneling work.
- **Sewer separation for CSO 143:** Sewer separation will be implemented within the combined sewer area tributary to CSO 143, thus eliminating this remote CSO upstream of Forest Manor Park.
- **Upper Pogues Run Improvements:** An underground storage facility will be constructed near Spades Park to store flows from nine outfalls located in Forest Manor, Brookside and Spades parks. Solids and floatables will be removed through a screening system. The facility will temporarily store combined sewage during a storm, until the existing interceptors have capacity to convey flow to the Belmont AWT plant. A collection interceptor will be constructed to convey captured CSO flow from CSOs 102, 101, 100, 099, 098, 097, 096, 095, and 036 to the underground storage facility.
- **Early Action Project:** The city has completed the Pogues Run I-70/Emerson Ave. and Brookside Park basins, a constructed wetland and retention pond built to control flooding, improve water quality and enable

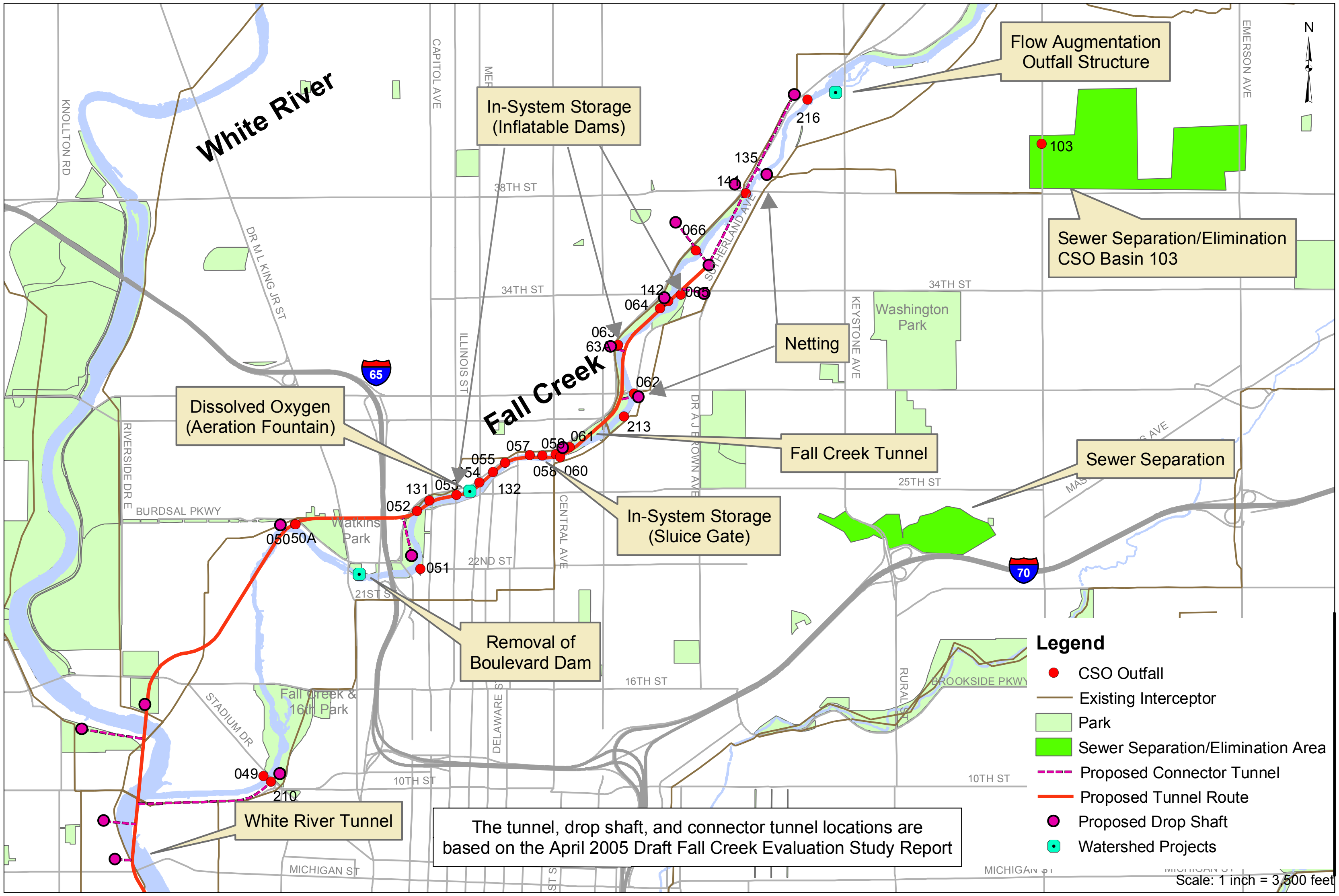


Figure 7-2
Fall Creek Watershed Control Measures

use of one barrel of the Pogues Run Tunnel for CSO storage and conveyance.

Although not a required component of the LTCP, at the city's discretion, the following non-CSO project may be implemented as needed to improve water quality conditions:

- **Flow Augmentation:** An effluent reuse force main may be constructed to discharge treated wastewater from the Belmont AWT plant into the upper CSO reaches of Pogues Run to improve the overall water quality during low-flow conditions. This option is dependent upon permitting authorities not requiring additional treatment to discharge AWT plant effluent to Pogues Run.

Figure 7-3 shows the approximate location and alignment of the Pogues Run control measures. Final facility locations and sewer alignments will be developed during facility planning and design.

7.3.4 Pleasant Run/Bean Creek Control Measures

Pleasant Run's flow is dominated by CSO discharges during wet weather because the existing interceptors lack capacity to convey all combined sewer flows to the treatment plant. The selected plan for Pleasant Run addresses this issue by providing an additional interceptor to convey captured CSO flow to the central tunnel. The city will construct the following control measures for Pleasant Run and Bean Creek:

- **Collection interceptors:** A collection interceptor will be constructed to capture and convey CSO flows from various outfalls along Pleasant Run to the central tunnel. The interceptor will begin at the upstream outfalls in Pleasant Run Golf Course, then run parallel to Pleasant Run in a southwesterly direction, connecting with the central tunnel at Bluff Road and Southern Avenue. An additional branch collection interceptor will capture CSO flow from outfalls along Bean Creek. The proposed alignment of both interceptors is shown in **Figure 7-4**.

- **Sewer Separation Tributary to CSO 017:** The city will separate the combined sewer area tributary to CSO 017, eliminating this remote CSO along Bean Creek.

- **Early Action Projects:** In-line netting has been installed at CSO 149 to control solid and floatable materials. Two inflatable dams have been installed at CSOs 080 and 084.

Although not a required component of the LTCP, at the city's discretion, the following non-CSO projects may be implemented as needed to improve water quality conditions:

- **Flow Augmentation:** An effluent reuse force main may be constructed to discharge treated wastewater from the Belmont AWT plant into the upper CSO reaches of Pleasant Run to improve the overall water quality during low-flow conditions. This option is based on an assumption that permitting authorities will not require additional treatment to discharge effluent to Pleasant Run.

Figure 7-4 shows the approximate location and alignment of the Pleasant Run/Bean Creek control measures. Final facility locations and sewer alignments will be developed during facility planning and design.

7.3.5 Eagle Creek Control Measures

The selected plan for Eagle Creek provides a collection interceptor that conveys CSO flows to the Belmont AWT plant. In conjunction with the city's early action projects, a relief interceptor also will redirect flows from the North Belmont interceptor and West Belmont interceptor to the proposed Eagle Creek collection sewer and West Marion County interceptor. The city will construct the following control measures for Eagle Creek:

- **Collection Interceptor:** A collection interceptor will be constructed, beginning at Little Eagle Creek and Vermont Street, then generally run parallel to Eagle Creek in a southeasterly direction, ending at the Belmont AWT plant headworks. The interceptor will reduce overflows from CSOs 033, 223, 032, 011, and 145 located along the creek. The collection interceptor also will convey approximately half of the flow from the proposed Belmont West Cutoff interceptor.

- **Belmont West Cutoff Interceptor:** In conjunction with an early action project, a relief interceptor (Belmont West Cutoff interceptor) is planned to divert flow from the Belmont North and Belmont West interceptors. Approximately half of its flow will be discharged into the proposed Eagle Creek Interceptor to be treated at Belmont AWT plant and the other half into the West Marion County Interceptor to be treated at Southport AWT plant. The proposed alignment of the collection and relief interceptors is shown in **Figure 7-5**.

Figure 7-5 shows the approximate location and alignment of the Eagle Creek control measures. Final facility locations and sewer alignments will be developed during facility planning and design.

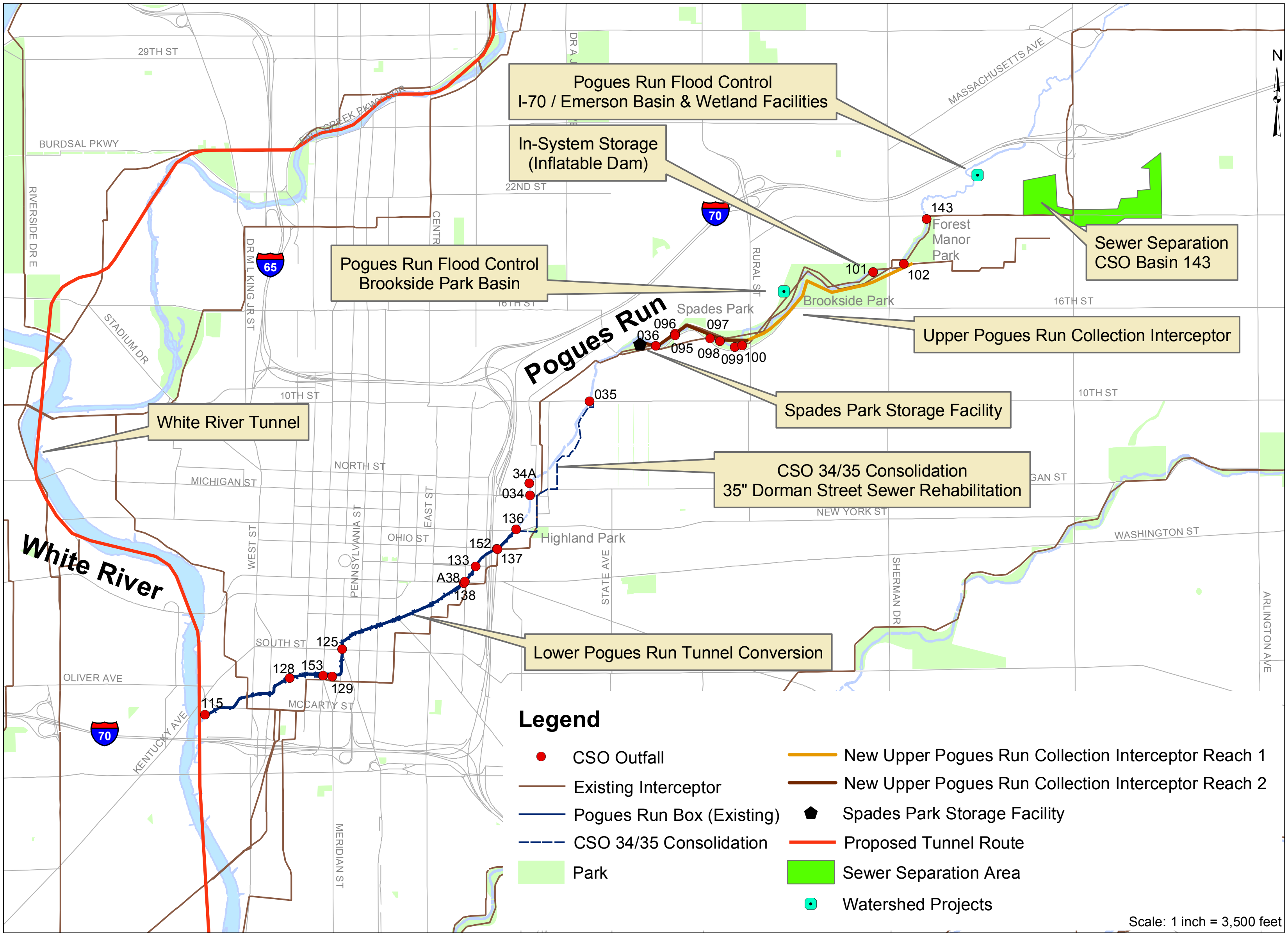


Figure 7-3
Pogues Run Watershed Control Measures

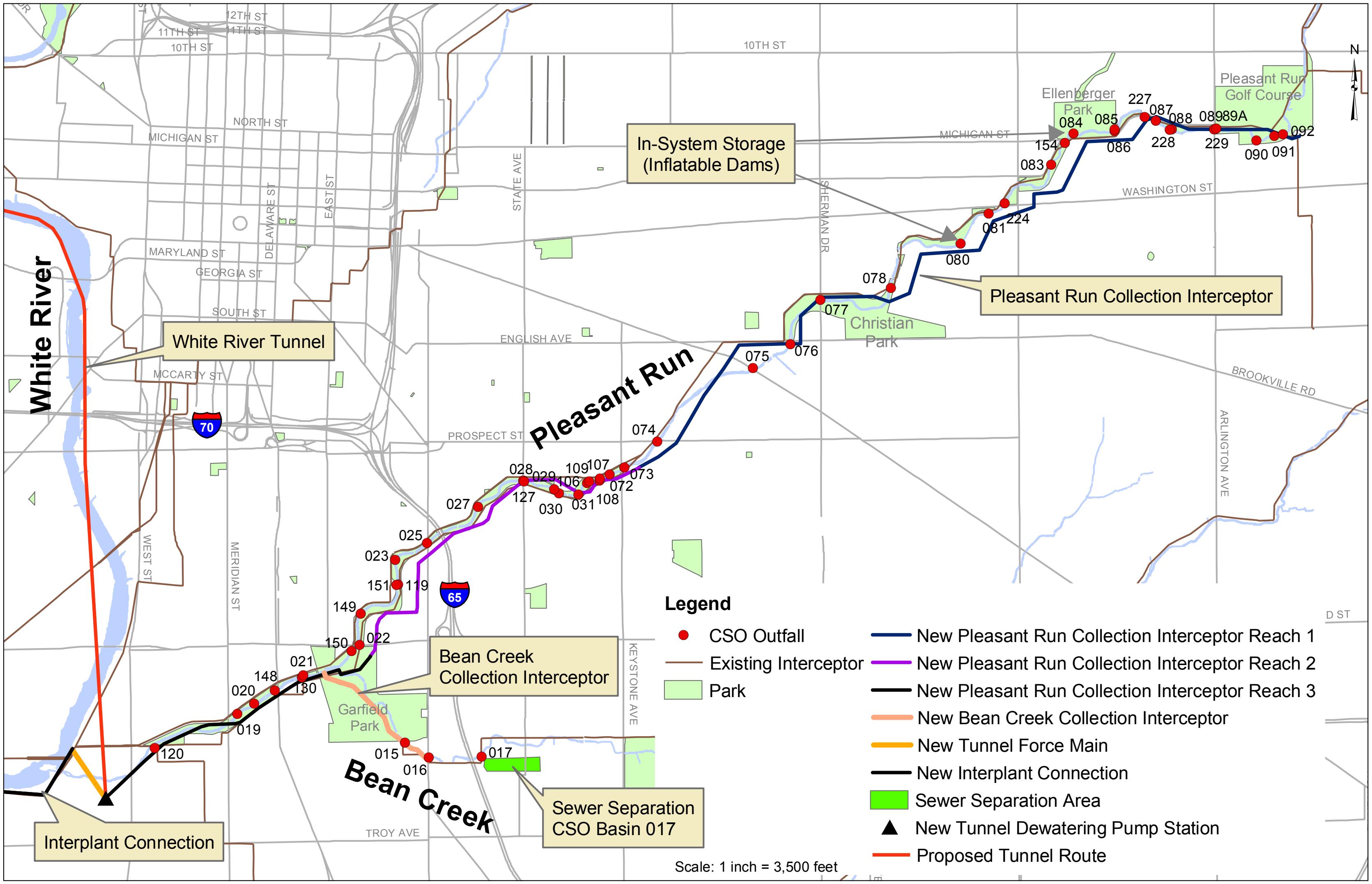


Figure 7-4
Pleasant Run Watershed Control Measures

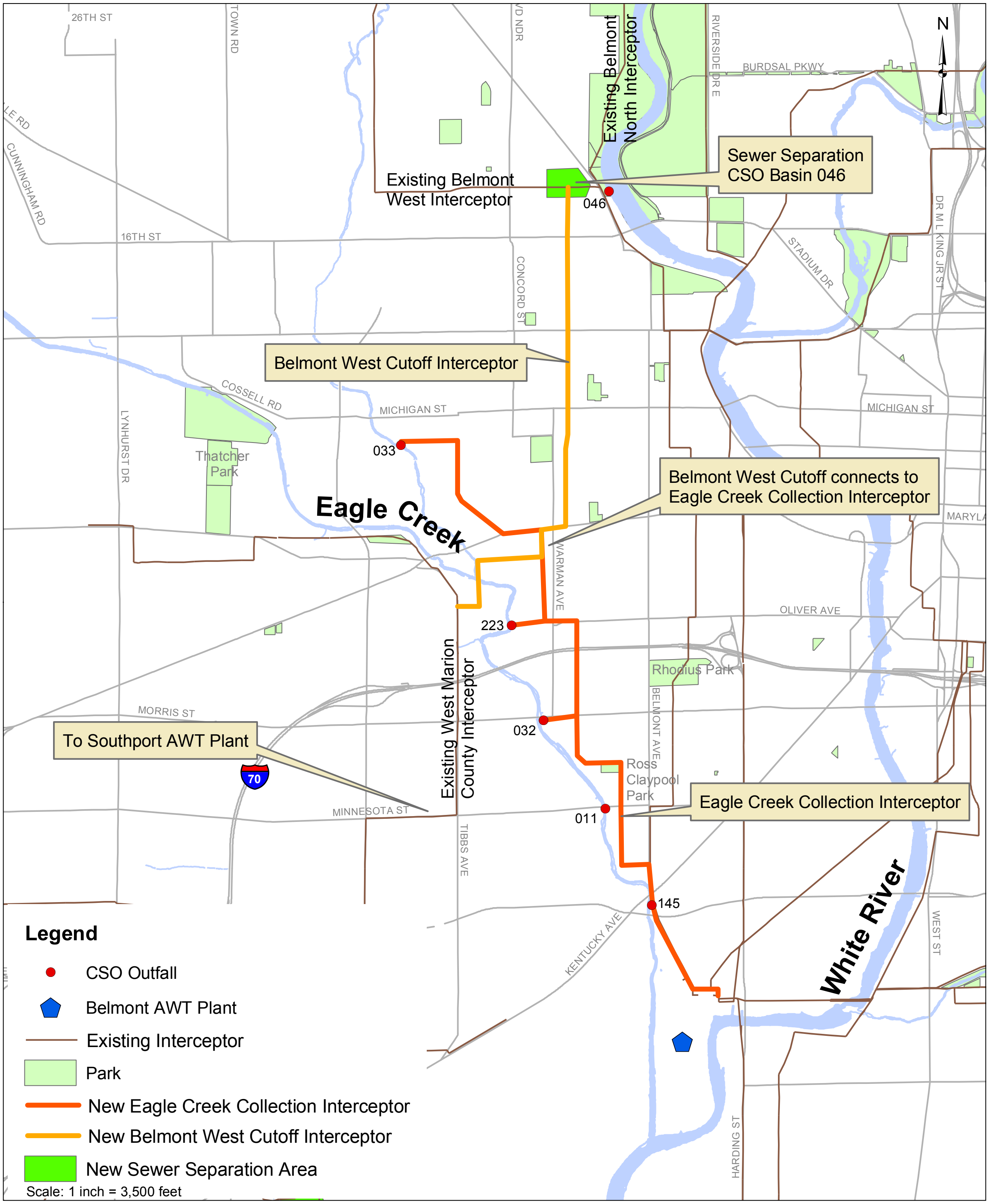


Figure 7-5
Eagle Creek Watershed Control Measures

7.3.6 Lick Creek and State Ditch Control Measures

Sewer separation is being employed in State Ditch and Lick Creek as part of the city's early action projects to eliminate CSOs 217, 218, and 235 in these watersheds. Affected neighborhoods were shown earlier in **Figure 7-1**.

7.3.7 White River Control Measures

Similar to Pogues Run, Indianapolis has aggressively addressed CSO impacts along the White River, with several control measures along the stream already completed. The selected plan for White River will complement already constructed projects to further control CSOs and improve the quality of White River. The city will construct the following control measures for White River:

- **Central Tunnel and Pump Station:** The central tunnel for White River will connect to the deep tunnel for the Fall Creek watershed, creating one continuous tunnel that runs parallel to White River in a southerly direction and ends near Bluff Road and Southern Avenue, near the Southwest Diversion Structure. A pump station will be constructed near this structure to dewater the White River and Fall Creek Tunnel and convey the stored flow into the interplant connection for ultimate treatment at the Southport AWT plant. Collection sewers and near-surface tunnels will be required to group CSOs along White River and direct them to the central tunnel. The city also will separate the combined sewer area tributary to CSO 046, eliminating this remote CSO along White River near Lafayette Road and 19th Street.
- **Riviera Club CSO Abatement:** A satellite storage facility will be constructed for CSOs 205 and 155 at the Riviera Club facility along upper White River. In conjunction with early action projects, a collection sewer will capture flows from CSO 205 and convey them to the storage facility.
- **Modifications to Lift Station 507:** In an early action project, the city modified Lift Station 507 at the Riviera Club to take advantage of available storage volume, and eliminated CSO 156 through sewer separation.
- **Rerouting of CSO 205 to Lift Station 507:** In an early action project, CSO 205 will be rerouted to Lift Station 507 at the Riviera Club. This project includes rehabilitation of upstream sewers to eliminate clearwater infiltration.
- **Sewer Separation at CSO 275:** In another early action project, the city will separate the combined sewer area tributary to CSO 275, eliminating this remote CSO along White River near 4900 South Foltz Street.
- **White River Screen at CSO 039:** The city installed a horizontal screen with automatic cleaning to remove floatables at this location in an early action project.
- **White River Overflow Storage and Primary Treatment (East Bank):** The city constructed a 3 MG underground, self-cleaning storage tank to provide overflow storage and primary treatment for CSO 039. This early action project may be modified during LTCP implementation to accept flows from CSOs 037 and 038 as well.
- **Additional Early Action Projects:** These projects include an additional barrel for the Harding/White River inverted siphon, pinch valves at Morris and Meikel and 10th and White River, an inflatable dam at CSO 118, a vortex separator pilot project at CSO 045, and interceptor capacity improvements.

Although not a required component of the LTCP, at the city's sole discretion, the following non-CSO projects may be implemented as needed to improve water quality conditions:

- **Dam Modifications:** To improve dissolved oxygen levels, the city may upgrade the Perry K Dam and alter an underwater structure along the Stout Dam that diverts flow into the Indianapolis Power & Light intake area during low flows.
- **Aeration:** The city may use portable aeration equipment to help improve White River's dissolved oxygen levels as needed during low-flow periods. A side-stream aeration facility or in-stream fountain located in White River above the Chevy Dam is expected to increase the dissolved oxygen levels in the river. This project is expected to enhance the overall stream quality while providing an aesthetically pleasing feature along the White River State Park.

Figures 7-6A and **7-6B** show the approximate location and alignment of the White River control measures. Final facility locations and sewer alignments will be developed during facility planning and design.

7.3.8 Treatment Plant Control Measures

7.3.8.1 Belmont AWT Plant Control Measures

The Belmont AWT plant has a design average flow capacity of 120 mgd with a peak hourly flow capacity of 270 mgd through primary treatment, but only 150 mgd of peak hourly flow capacity for secondary and advanced treatment (two-

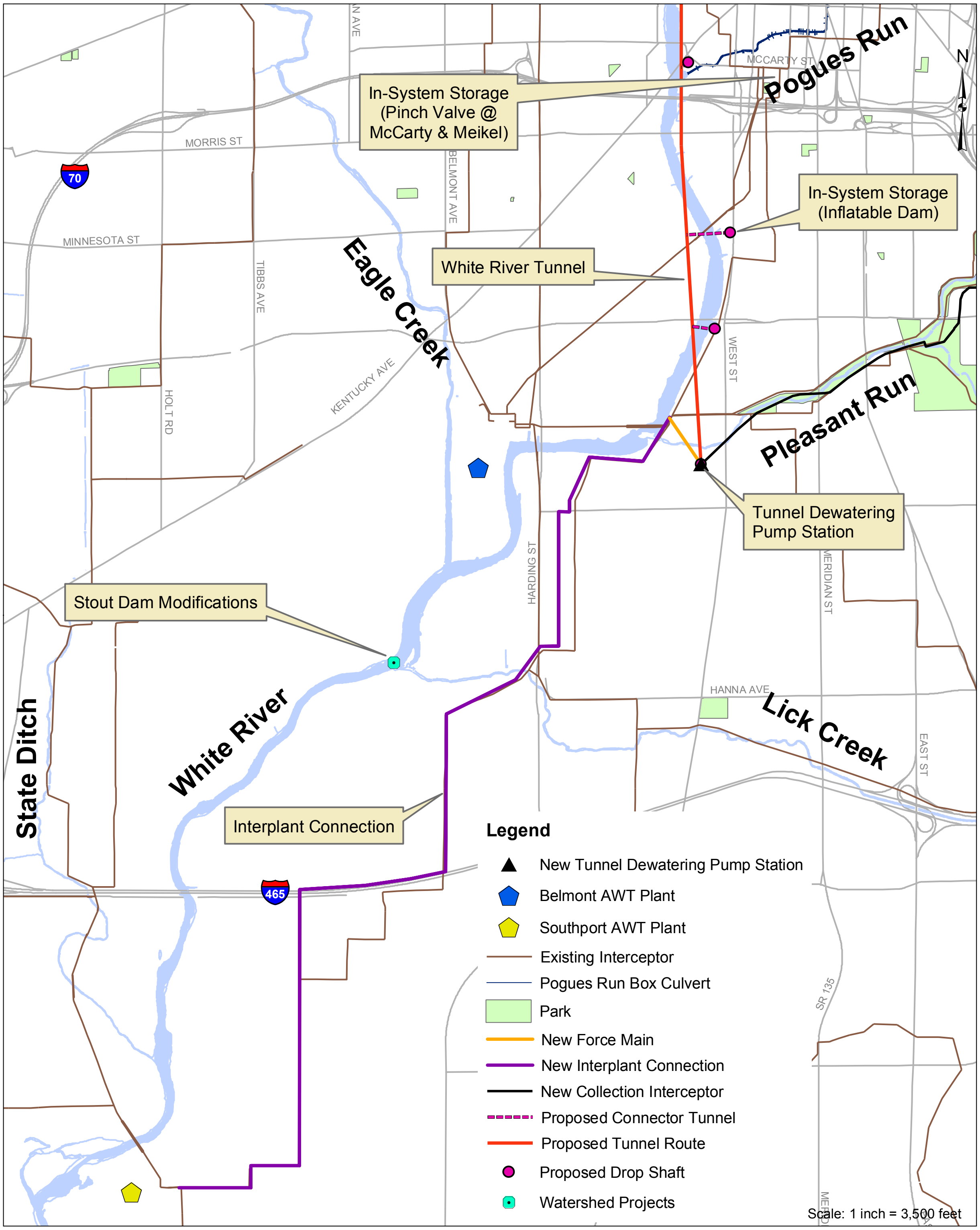


Figure 7-6a
White River Watershed Control Measures
Map 1 of 2

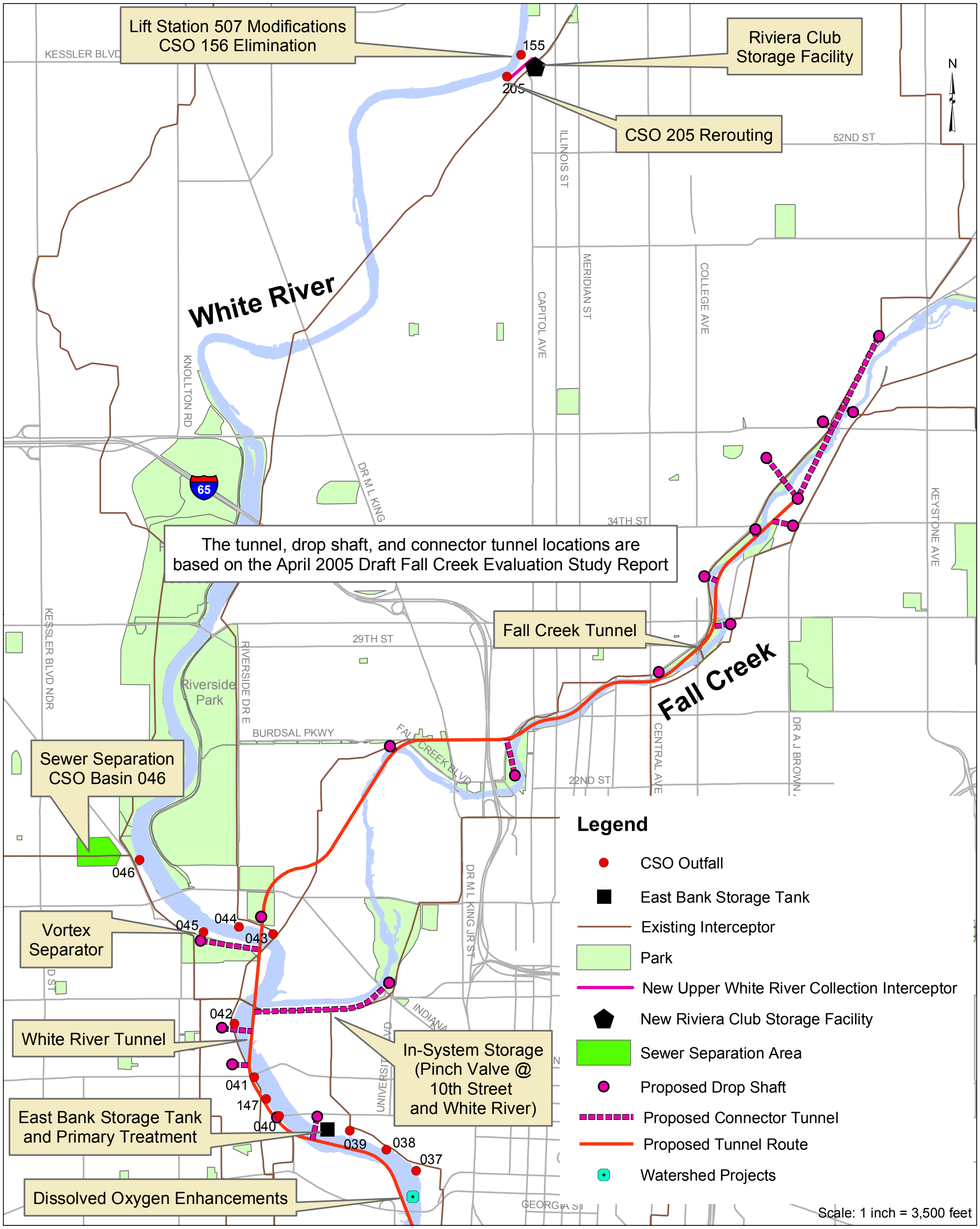


Figure 7-6b
White River Watershed Control Measures
Map 2 of 2

stage biological nitrification, filtration and effluent disinfection). The Belmont AWT plant predominantly serves the combined sewer system and therefore experiences substantial surges of flow during wet weather. Wet-weather flows that exceed the headworks pumping capacity overflow as combined sewage from CSO Outfall 008. Wet-weather flows that exceed secondary treatment capacities are discharged through the primary effluent (PE) Bypass at Outfall 007.

Collectively, the annual wet-weather volume of combined sewage and primary effluent discharged from the Belmont facility accounts for nearly half of the total CSO volume discharged to Marion County streams. The PE Bypass is the single largest source of BOD imposed on the White River during wet weather. Accordingly, the objectives for wet-weather improvements to the Belmont plant are to:

1) eliminate the non-emergency need for a primary effluent bypass, and
2) reduce the headworks combined sewer overflows.

The selected concepts for expanded and upgraded wet-weather treatment processes at the Belmont facility will maintain the existing design average capacity at 120 mgd, but expand the peak hourly capacity through conventional secondary treatment to 300 mgd. Additional wet-weather pumping capacity will be provided at the headworks to reduce wet-weather overflows to Outfall 008. The Belmont control measures needed to eliminate the wet-weather primary effluent bypasses and reduce headworks overflows are as follows:

- **Gravity Belt Thickeners:** Installation of gravity belt thickeners with possible modification of the existing Dissolved Air Flotation system to allow the system to be used for additional storage. This is an early action project.
- **Bio-Roughing Clarifiers:** New aeration tanks and intermediate clarifiers to upgrade the existing trickling filter bio-roughing process to a 150-mgd trickling filter solids contact (TF/SC) secondary treatment process. Collectively, the improvements will enable up to 300 mgd of biological treatment at the Belmont facility during wet weather, thereby doubling the current 150 mgd peak hourly capacity.
- **Belmont AWT Plant Improvements:**
  - Rehabilitation and expansion of original, abandoned Belmont headworks facility for a peak wet-weather capacity of 150-300 mgd with new screening and aerated grit removal.
  - Reopening and replacement of original, abandoned Belmont sewers.
  - Two new wet-weather storage basins (early action projects) that will reduce primary effluent bypasses during the interim period needed for upgrading the first-stage bio-roughing process to biological treatment. These storage basins will ultimately be used to collect captured CSO flow from the expanded headworks pumping facility for bleed-back to the expanded treatment system and/or transfer to the Southport plant or supplemental disinfection and discharge. This will require construction of a new wet-weather discharge outfall and disinfection system.
  - Two new primary clarifiers to supplement the existing clarifiers.
  - New sewer from Outfall 008 for flow diversion.
  - New process/yard piping.
- **Wet-Weather Chlorination/De-chlorination:** Rehabilitation and expansion of an existing abandoned chlorine contact tank to provide 150-mgd disinfection capacity for the TF/SC effluent. Retrofitting the original Belmont outfall for discharge of the disinfected TF/SC effluent during wet weather. An additional outfall from the flow equalization basins will be routed to the new wet-weather chlorination/dechlorination tank.
- **Additional Early Action Projects:** These projects include several operational improvements to better equip the Belmont AWT plant to receive wet-weather flows, including a septage receiving area pumping station, vacuum-swing adsorption (VSA) expansion and ozonation rehabilitation, pre-aeration to primary clarifier conversion, and restoring the pump bypass to the Southport AWT plant.

Figure 7-7 shows the approximate location and alignment of the Belmont AWT plant control measures. Final facility locations and sewer alignments will be developed during facility planning and design. IDEM also will need to approve revised wet-weather discharge limits in the Belmont NPDES permit, as described in Section 4.5.3. The city's permit modification request is pending at the agency.

The capital cost for improvements to the Belmont facility described in this section is $185.3 million, as shown in **Table 7-1**. This selected approach is subject to more detailed design analysis and value engineering during facility planning and design.

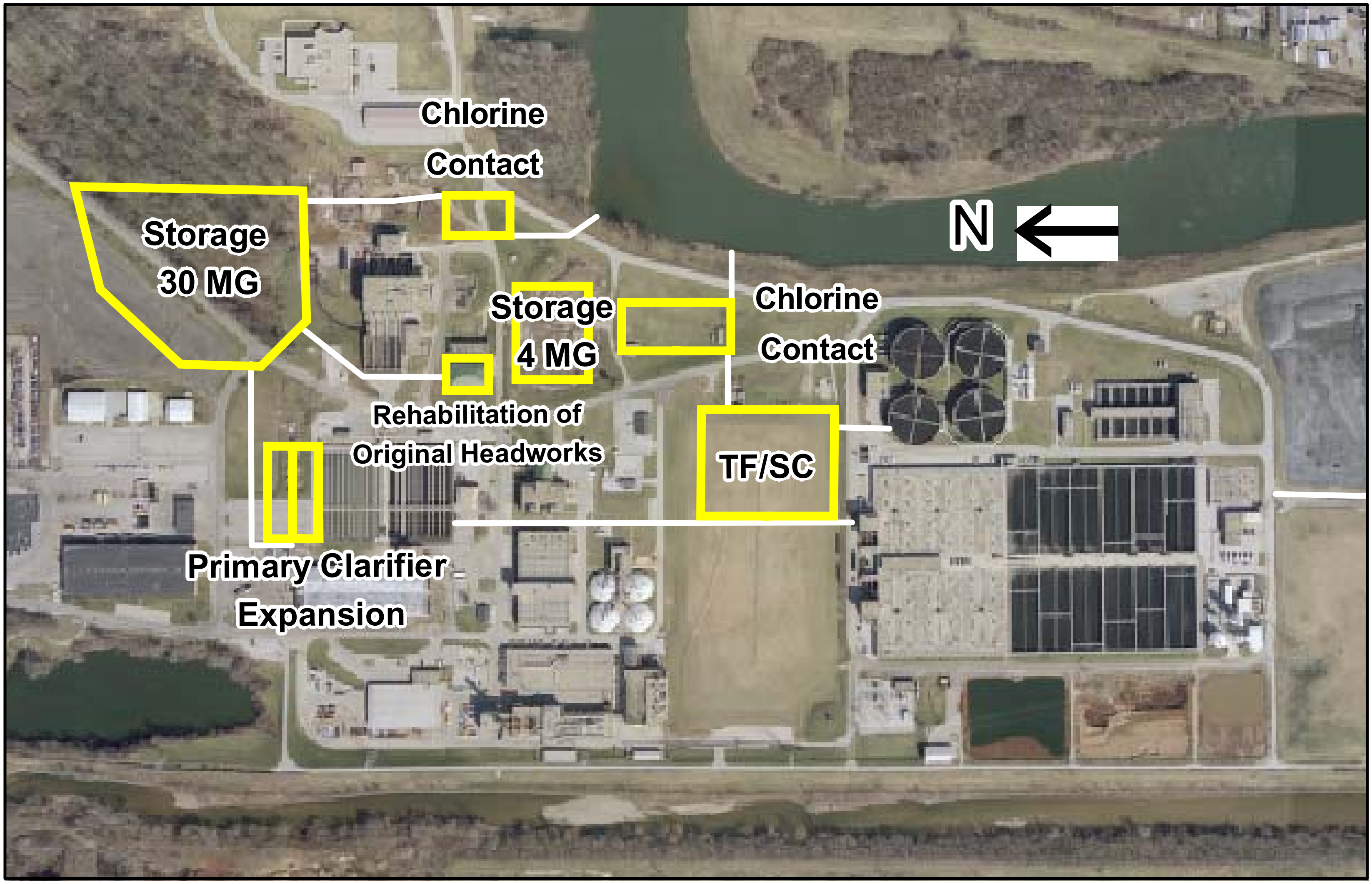


Figure 7-7
General Layout of Belmont AWT Plant Treatment Improvements

7.3.8.2 Southport AWT Plant Control Measures

The city developed and evaluated alternatives that will enable the Southport AWT plant to treat current wet-weather flow surges, future captured CSO flows, and additional dry-weather flow from future growth within the service area.

The city will expand the Southport facility to enable a peak hourly flowrate of 350 mgd through conventional primary treatment and, after flow equalization, a peak secondary treatment capacity of 300 mgd. The 300-mgd peak capacity represents a 150-mgd increase over the current peak capacity of 150 mgd. If necessary to meet the performance criteria in Table 7-5, an enhanced high-rate clarification (EHRC) facility will be constructed to treat captured CSO flows at a peak rate of 75 mgd.

The selected plan for expanding the Southport AWT plant is as follows:

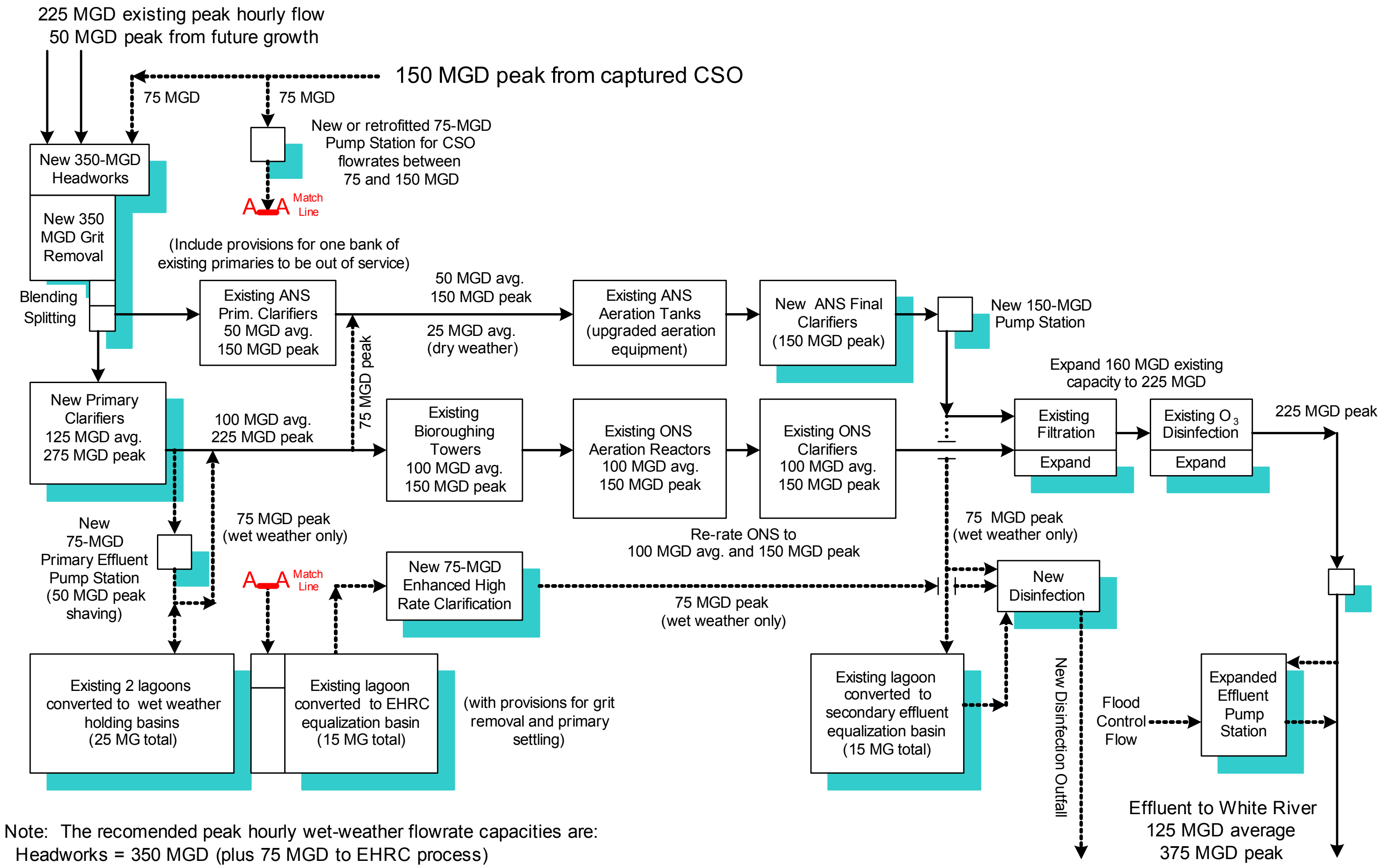
- Construction of all new headworks, including screening and aerated grit removal. This selected plan is based on the nearly threefold increase in anticipated capacity and the importance of a blended raw wastewater for downstream process reliability.
- Construction of a wet-weather pump station and wet-weather holding basins for flow equalization to reduce the peak hourly flow through the headworks, preliminary treatment and primary treatment. These projects are part of the city's early action projects already under underway.
- Supplement the existing primary clarifiers with new primary clarifiers. These improvements will allow for one of the existing cluster of air nitrification system (ANS) primary clarifiers to be occasionally out of service for maintenance. The existing primary clarifiers will generally be on line all the time at a relatively low flow in readiness for treating wet-weather surges up to 150 mgd.
- Retrofit the existing 30-mgd ANS to provide 150 mgd of biological treatment during peak wet-weather flow periods, including efficient nitrification at flows up to about 120 mgd. The existing aeration tanks will be fitted with new fine bubble air diffusers and the aeration blowers will be replaced or supplemented as needed. The existing ANS final clarifiers will be replaced with larger circular or rectangular units having a peak capacity of 150 mgd. New ANS return activated sludge pumps and an ANS effluent pumping station will be added.
- Leave the existing oxygen nitrification system (ONS) intact, but revise the rated capacity upward to 100 mgd average (compared to 95 mgd average) and 150 mgd peak (compared to 125 mgd). The basis of the improved rating will be demonstrated performance, upgraded primary clarification to reduce the solids loading, recognized design criteria, and elimination of flows imposed on the ONS from filter backwashing.
- Conversion of one 15-MG existing sludge lagoon to a secondary effluent equalization basin with post-aeration mixers. This will allow the operators time to start up the intermittently operated disinfection facility.
- New 150-mgd disinfection system for the treated CSO flows (assumes chlorination/ dechlorination).
- Expansion of the existing 160-mgd filtration process to 225 mgd capacity.
- New 75-mgd CSO pump station for captured CSO flows.
- New 75-mgd EHRC facility for captured CSO flows, if necessary to meet performance criteria.
- Expansion of the existing ozone disinfection system.
- Expansion of the existing effluent pump station to meet the new effluent capacity.
- New process/yard piping to connect new and revised systems.

Figure 7-8 shows the approximate location and alignment of the Southport AWT plant control measures. Final facility locations and sewer alignments will be developed during facility planning and design. Permit modifications will be required for these control measures.

The capital cost for improvements to the Southport facility described in this section is $255.9 million, as shown in **Table 7-1**. This selected concept is subject to more detailed process analysis, cost comparisons and value engineering during facility planning and design.

7.3.8.3 Interplant Connection Control Measure

The interplant connection consists of an interceptor that will originate near CSO 117 (east of the Belmont plant near Southern Avenue on the east side of White River) and terminate near the headworks of the Southport facility. Initially, the interceptor will store and convey CSO flow captured from Structure 117. After the deep tunnel system is constructed, the new interceptor will convey CSO flows captured in the tunnel. **Figure 7-9** shows the approximate alignment of the interplant connection interceptor. Final alignment will be developed during advanced facility planning and design. The capital cost for the interplant connection is estimated to be $131.7 million.



Note: The recomended peak hourly wet-weather flowrate capacities are:
Headworks = 350 MGD (plus 75 MGD to EHRC process)
Preliminary & Primary Treatment = 350 MGD (with one ANS module out)
Peak Flow Reduction by Equalization = 50 MGD
Biological Nitrification = 225 - 300 MGD (300 MGD firm Act. Sludge Treat.)
Filtration = 225 MGD (excludes 150 MGD captured CSO)
Enhanced High Rate Clarification = 75 MGD
Plant Effluent Peak Discharge Rate = 375 MGD
Plant Effluent Design Average Discharge Rate = 125 MGD

Figure 7-8
Southport AWT Plant Improvements Schematic

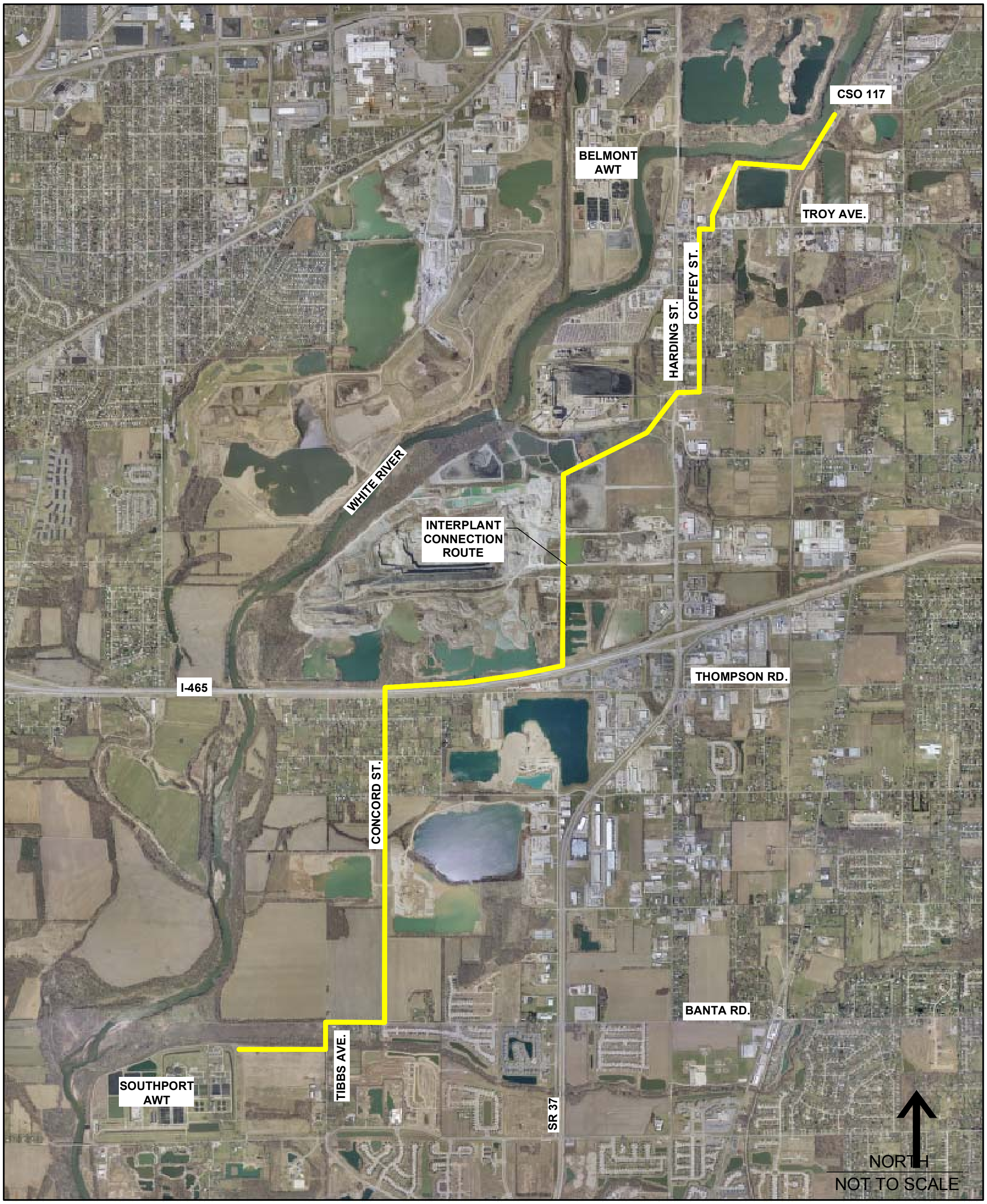


Figure 7-9
Proposed Routing of the Interplant Connection

7.3.9 Systemwide Watershed Improvement Control Measures

In order to maximize the benefits to water quality, stream aesthetics and human health, the city anticipates proceeding with additional non-CSO improvements referred to as "watershed improvement projects." As noted earlier in Section 4.5.2.8, these improvements are designed to address non-CSO sources of pollution in the watersheds or maximize the benefits of the city's selected CSO control plan. These improvements are anticipated to include:

- At the city's sole discretion, building sewers for neighborhoods now served by failing septic systems. This program includes constructing interceptors and sewer main extensions to provide sewer service to approximately 18,000 homes currently on failing septic systems. Neighborhood projects are prioritized in the Septic Tank Elimination Program (formerly Barrett Law) Master Plan. The costs shown in **Table 7-1** represent the city's cost of accelerating septic conversions from a 60-year program to a 20-year program. Full capital costs of the septic conversion program are not included in the LTCP costs, but they were factored into the city's financial capability analysis as anticipated costs.
- Continuing implementation of real-time controls (RTC) and in-system storage to improve the city's ability to manage flows within the existing sewer system. The RTC program will first evaluate the ability to modify or upgrade large lift stations to take advantage of existing storage opportunities. Secondly, the program will focus on other existing control devices to maximize potential low-cost in-line storage opportunities. Once these areas have been explored, the RTC program will then examine "flow shunting" opportunities and other in-line storage possibilities. A detailed description of the in-line storage projects is included in the May 2003 *CSO Operational Plan*.
- Continuing implementation and refinement of the city's industrial pretreatment permitting policy and process, which documents how the Indianapolis Department of Public Works's (DPW) Office of Environmental Services makes decisions on new or increased discharges by the industrial pretreatment community, particularly in the combined sewer area. It is the policy and goal of the City of Indianapolis to encourage economic growth and vitality and to be able to compete both globally and regionally for new employers and employees. The city's LTCP will accommodate future growth by providing sufficient sewer system capacity and treatment plant baseload capacity to accommodate anticipated industrial, commercial and residential growth in Marion County, in addition to required wet-weather capacity.
- Restoring streambanks and removing polluted sediments from streams. This program will include the preservation and restoration of a variety of vegetative habitats located on publicly-owned grounds adjacent to streams or immediately upstream of drainageways.
- Flow augmentation and/or aeration in individual streams, as described within each watershed description above.
- Combined sewer improvements and rehabilitation projects conducted in 2001-2002.

While these improvements are not directly related to state or federal CSO control requirements, they show the city's willingness to go beyond minimum requirements to improve water quality in neighborhood streams. The city will not be required to build or operate flow augmentation facilities if permitting authorities require higher treatment of AWT plant effluent to discharge to the smaller streams. Flow augmentation will be at the city's sole discretion.

7.4 LTCP Benefits

7.4.1 Environmental Benefits

This section describes how the selected plan is expected to improve use attainment and environmental conditions in Marion County and downstream areas. Environmental benefits include restoring beneficial uses, pollutant load reductions, BOD removal, improvements in dissolved oxygen (DO) and *E. coli* bacteria, capture of solids and floatables, and containment of the first flush.

The city will design and implement the plan to ensure that CSOs will not cause dissolved oxygen violations in the White River and Fall Creek. For this reason, the selected plan is expected to fully restore aquatic life uses by preventing CSO-related fish kills and reducing stress on fish and other aquatic wildlife. By capturing the first flush and achieving 95 percent capture of CSOs and an expected 4 overflow events in the average year (97 percent and an expected 2 overflow events on Fall Creek), the selected plan also will significantly reduce or eliminate odors, floating sewage, and trash in neighborhood streams.

The city uses average annual statistics for the White River and its tributary watersheds to describe the plan's environmental benefits. The findings are based on analyses using the NetSTORM hydraulic model and precipitation data from 1950 through 2003. Annual precipitation statistics in Indianapolis yield the following averages:

- Annual precipitation averages 39.7 inches
- Four storm events are equal to or greater than a 3-month storm (equivalent to 1.00 inch of rain in a 3-hour period or 1.57 inches in a 24-hour period)
- Two storm events are equal to or greater than a 6-month storm (equivalent to 1.27 inches of rain in a 3-hour period or 1.99 inches in a 24-hour period)
- The average number of hours per year with precipitation of 0.01 inches or more is 602, with lower-than-average values seen since 1994 when the National Weather Service switched from manual to automated precipitation measurements
- The mean time between storm events during the year is 76 hours

7.4.2 CSO Volume and Frequency Reduction

Figure 7-10 compares the systemwide average annual overflow volumes for pre-2002 sewer system conditions and the selected plan. **Figure 7-11** presents the same comparison for each individual watershed. The selected plan is expected to reduce the average annual CSO volume from 5.7 billion gallons to 0.6 billion gallons, which is an 89 percent reduction in CSO volume. Under U.S. EPA guidelines, the city calculates the plan's percent capture as the volume captured and treated during wet-weather conditions divided by the total volume of flow in the combined sewer system during wet-weather conditions. The volume captured and treated includes flow captured and treated under pre-2002 conditions. The total volume of flow is the sum of the volume captured and treated and the overflow volume. When this calculation is applied, the selected plan will achieve 97 percent capture in the Fall Creek watershed and 95 percent in other watersheds, compared to a systemwide 63 percent capture under pre-2002 conditions. The selected plan also is expected to eliminate all non-emergency Primary Effluent Bypass overflows at the Belmont AWT plant, which account for 2.2 billion gallons on an average annual basis.

In years that have higher precipitation amounts and/or more large storms than in a typical year, the percent capture achieved may be less than 95 percent (97 percent for Fall Creek). Conversely, in years that have less precipitation and/or fewer large storms than in a typical year, the percent capture achieved may be more than 95 percent (97 percent for Fall Creek).

As discussed in Section 4.6.4.4, the frequency of overflow events is expected to range from zero to six events on Fall Creek and zero to 10 events on other CSO receiving waters in any given year, depending on the frequency, severity and distribution of rainfall in Marion County. The selected plan is expected to reduce the average annual overflow frequency from 60 storms per year to approximately two storms per year on Fall Creek and four storms per year on other waterways, based on average rainfall statistics for Indianapolis. Each of these large storms could cause at least one and probably most of the individual overflow points to discharge within the sewer system – creating what is known as an "overflow event."

Figure 7-12 illustrates the city's modeled analysis of overflow frequency based upon rainfall data collected from 1950-2003. The bars labeled "baseline conditions" show the number of overflow events that would have occurred each year with the sewer system performing under pre-2002 conditions. The bars labeled "selected LTCP" predict overflow frequency with a 95/97 percent capture plan in place. The graph shows results for both Fall Creek at 97 percent capture and White River and other tributaries at 95 percent capture. The city's current model predicts that 216 overflow events would have occurred on White River during the 54-year record of storms, for an annual average of four events. Actual events would have varied from zero to 10 per year, depending on rainfall and snowmelt conditions. On Fall Creek, frequency would have ranged from six to zero. This represents a dramatic decrease from current conditions.

Figure 7-13 illustrates the city's modeled analysis of overflow frequency during the April-October recreational season, based upon the same 1950-2003 precipitation record. The graph compares pre-2002 sewer conditions with predicted results of the selected LTCP. Based upon this historic rainfall data, the city's current model predicts that overflow frequency during the recreational season would be reduced dramatically from the current average of 37 events during the seven-month recreational season to an average of 1.5 on Fall Creek and 2.8 on White River and the remaining tributaries, with actual events varying from six to zero during the warmer months. On Fall Creek, overflow frequency during the recreational season would have varied from five to zero events during this time period.

Figure 7-14 illustrates the monthly modeled distribution of overflow events, again comparing pre-2002 sewer conditions with the selected LTCP. The bars show the number of events that the current model predicts would have occurred during each month over the 54-year period. For instance, 348 events would have occurred in May from 1950-2003 under the December 2001 sewer conditions, while just 21 events would have occurred in May on White River and 10 on Fall Creek during that 54-year period if the selected LTCP had been implemented. This graph shows a dramatic reduction in the frequency of overflow events throughout the year.

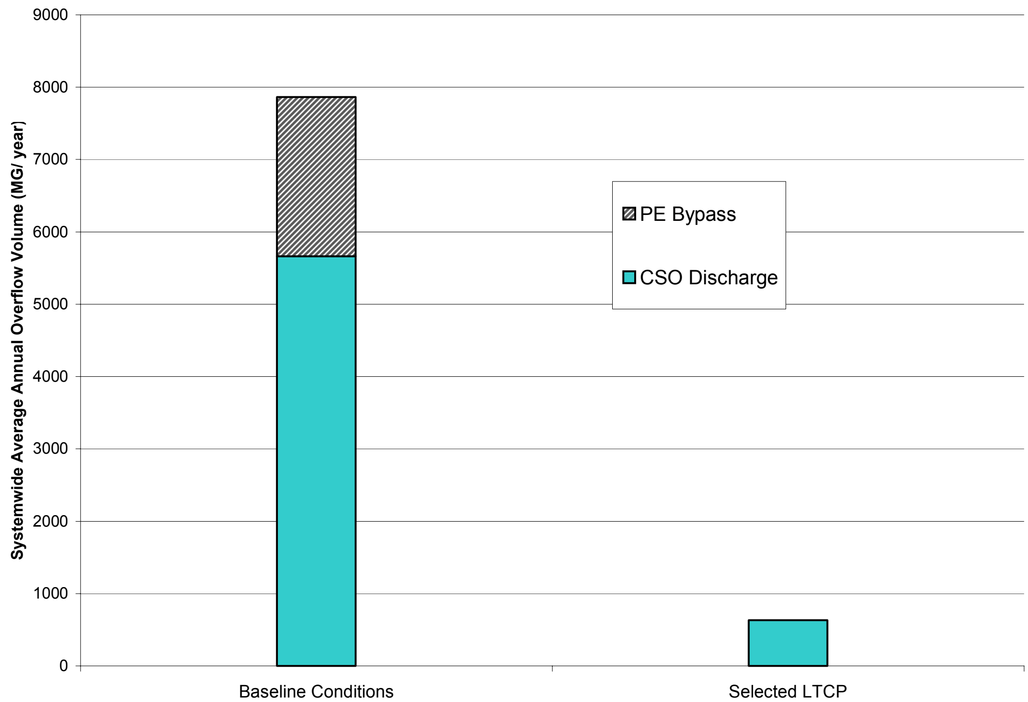


Figure 7-10
Modeled Comparison of Average Annual CSO Volume for Baseline Conditions and the Selected LTCP

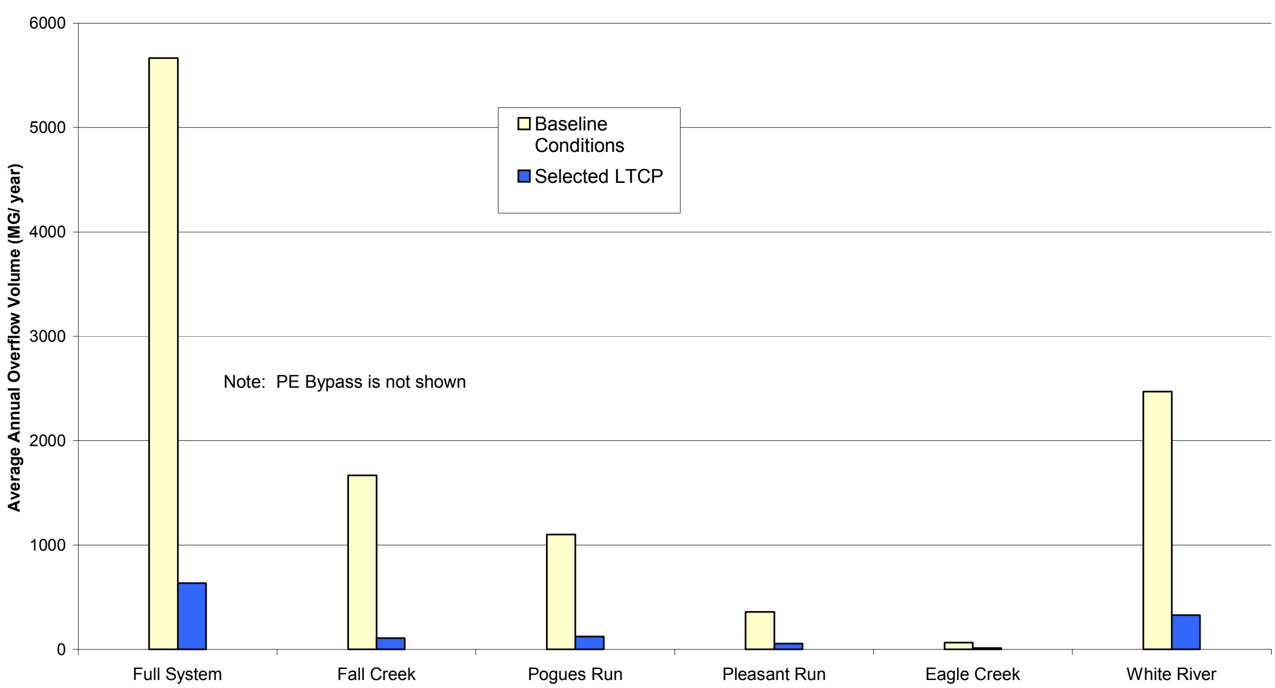


Figure 7-11
Modeled Comparison of Average Annual CSO Volume for Baseline Conditions and the Selected LTCP by Individual Watershed

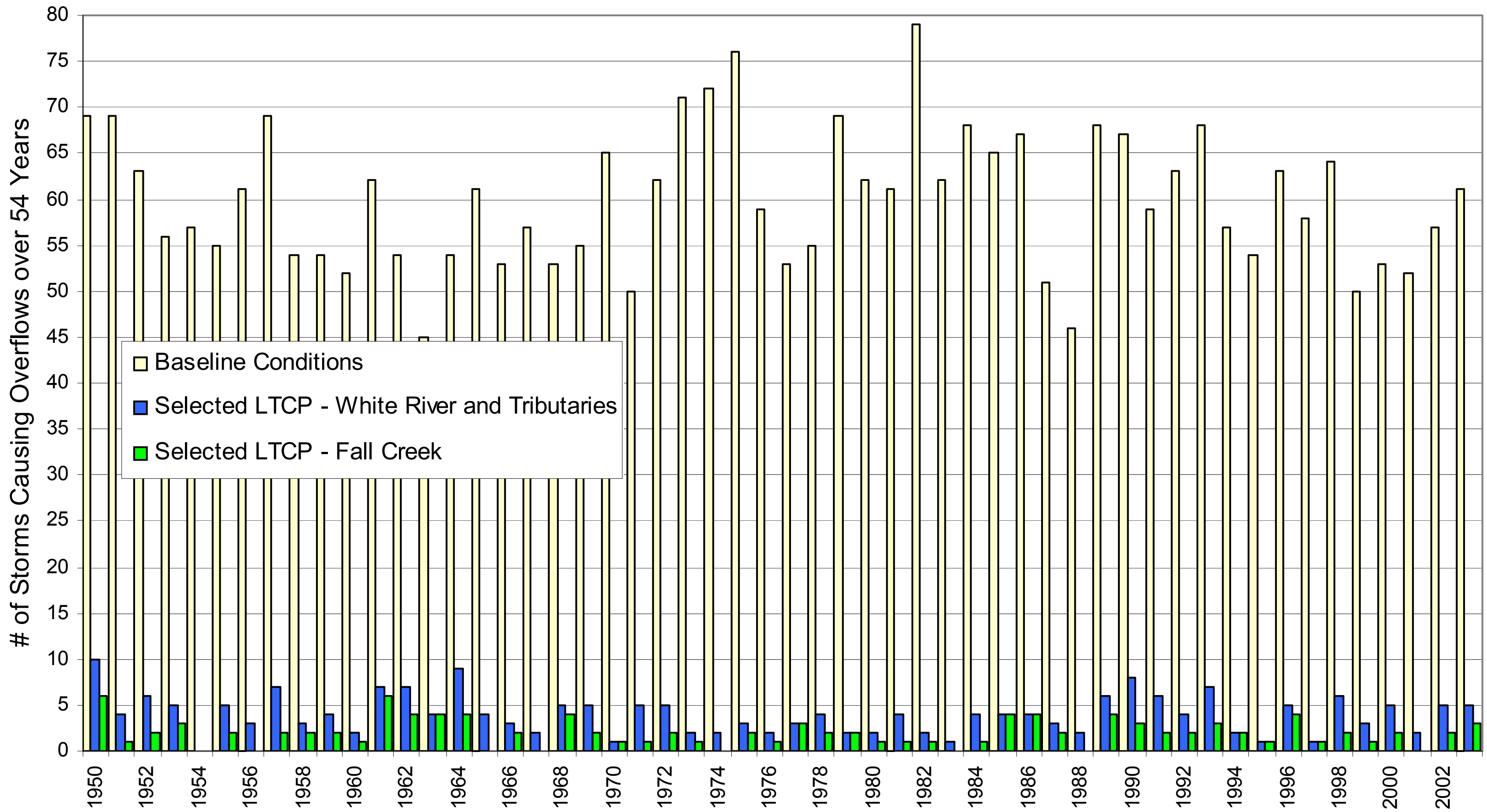


Figure 7-12
Estimated Number of Storms Causing Overflows Per Year, 1950-2003
Baseline Conditions vs. Selected LTCP

Source: 1950-2003 NetSTORM Simulation. Pre-2002 Conditions and Selected LTCP
Notes:

(1) For baseline conditions, there is an average annual frequency of 60 overflow events per year. The distribution of the 60 events is based on the 54-year precipitation record.

(2) It is estimated that at least one CSO outfall structure would discharge for the listed number of dates each year.

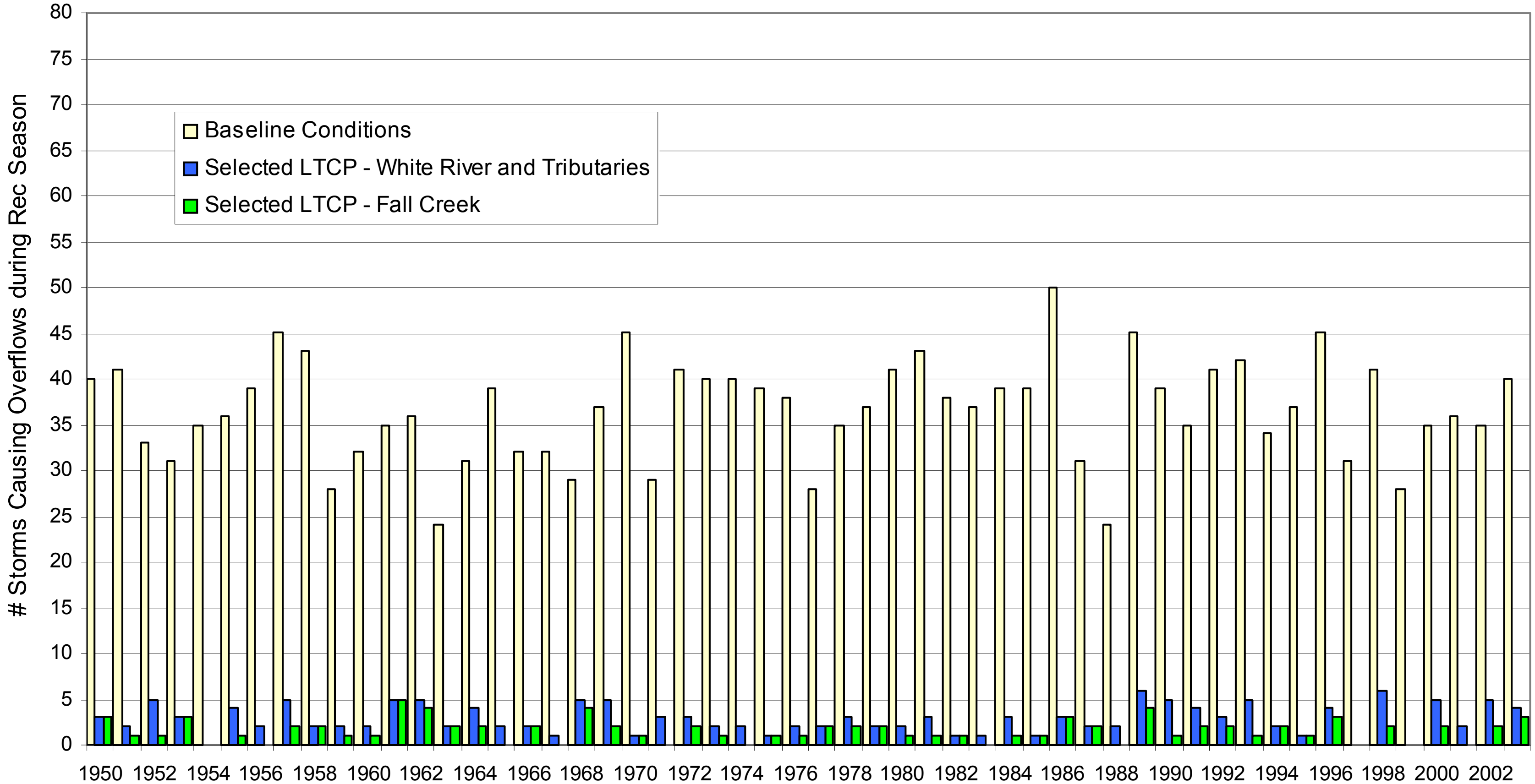


Figure 7-13
Estimated Number of Storms Causing Overflows During April - October, 1950-2003
Baseline Conditions vs. Selected LTCP

Source: 1950-2003 NetSTORM Simulation. Baseline Conditions and Selected LTCP.
Notes:

(1) The Recreational Season is defined as the months of April through October.
(2) For Baseline conditions, there is an average annual frequency of 60 overflow events per year. The distribution of the 60 events is based on the 54-year precipitation record. The average annual frequency during the Recreational Season is 37 events.
(3) It is estimated that at least one CSO outfall structure would discharge for the listed number of dates each year.

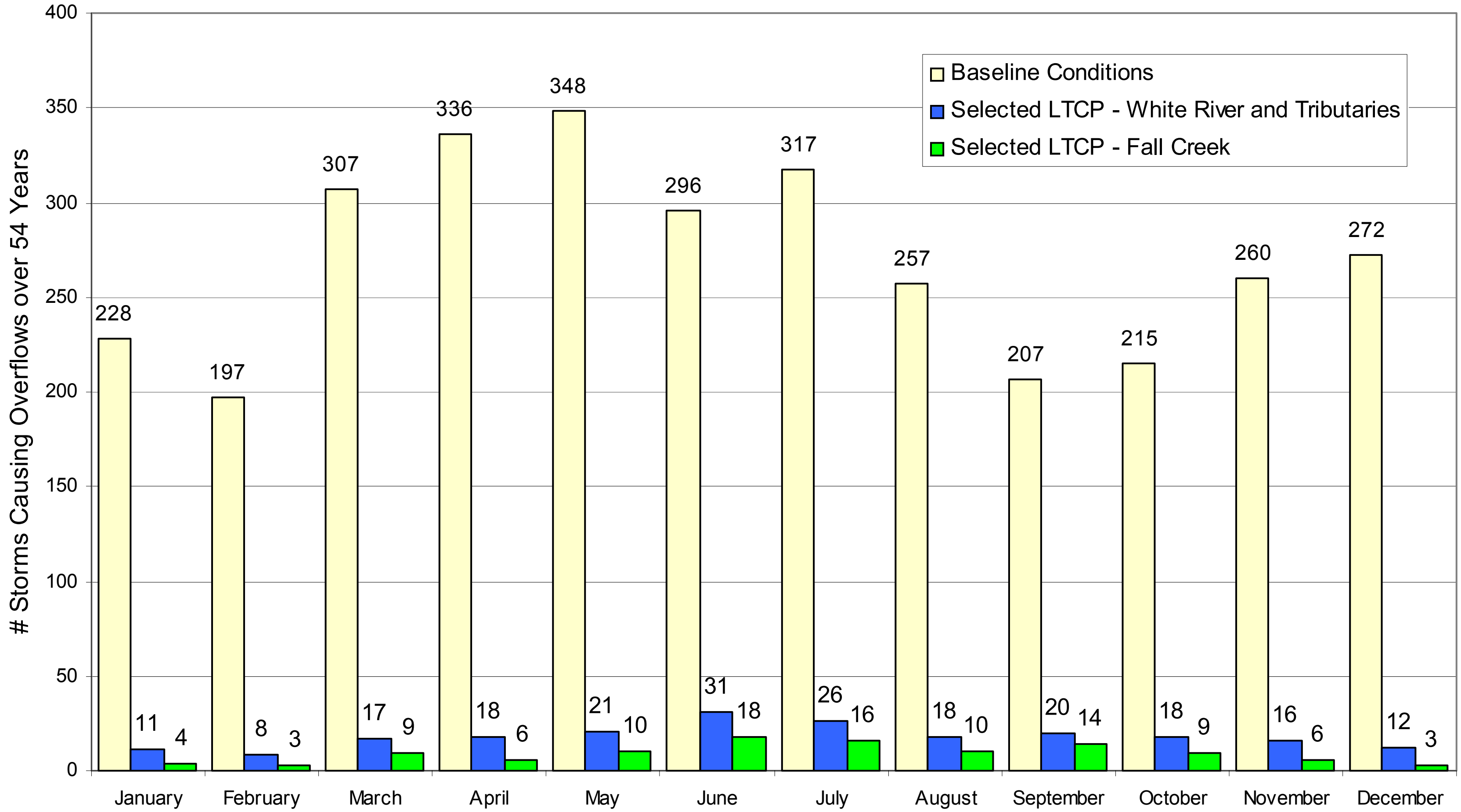


Figure 7-14
Estimated Storms Causing Overflows Distributed by Month, 1950-2003
Baseline Conditions vs. Selected LTCP

Source: 1950-2003 NetSTORM Simulation. Baseline Conditions and Selected LTCP.
Notes:
(1) For baseline conditions, there are 3240 events presented over 54 years of record for an annual average frequency of 60 events per year.
(2) It is estimated that at least one CSO outfall structure would discharge for the listed number of dates each month.

Precipitation patterns in some years may cause more than four overflow events (or two on Fall Creek), but the percent capture may be greater than 95 percent (97 percent on Fall Creek). Conversely, some years may have fewer than four overflows (two on Fall Creek), but the percent capture may be less than 95 percent (97 on Fall Creek).

Larger storms and back-to-back storms tend to occur more frequently in the spring and summer months in Indianapolis, causing overflows to persist in those months. However, high stream flows during and after those larger storms will cause waterways to be more unsafe as well as unattractive for recreational use.

7.4.3 Dissolved Oxygen Standard Attainment

The selected plan is expected to eliminate violations of the 4.0 mg/L dissolved oxygen standard by achieving 95 percent capture in White River and 97 percent capture on Fall Creek. The city also plans to remove Boulevard Dam in Fall Creek, modify Chevy and Stout dams in White River, and provide aeration, if needed, within White River and Fall Creek to ensure attainment of the dissolved oxygen standard. This is expected to ensure sufficient dissolved oxygen to support a vigorous aquatic community in affected waterways.

7.4.4 Recreational Use Attainment

The ability of streams to attain the state's recreational use designation is partially dependent upon meeting the *E. coli* bacteria standard. The *E. coli* bacteria performance of the Indianapolis system was evaluated for six different criteria:

- Average annual *E. coli* bacteria load discharged by CSOs,
- Monthly geometric mean standard of 125 cfu/100 mL,
- Indiana TMDL reference criteria of no more than 36.5 days per year over 235 cfu/100 mL,
- Number of days per year with concentrations above 2,000 cfu/100 mL,
- Number of days per year with concentrations above 5,000 cfu/100 mL, and
- Number of days per year with concentrations above 10,000 cfu/100 mL.

The selected plan will reduce *E. coli* bacteria discharges to the White River and its tributary watersheds through CSO Control Measures. Although not a required component of the LTCP, the watershed improvement projects are designed to achieve additional reductions to *E. coli* bacteria loads, particularly from dry-weather sources and stormwater run-off, and also to increase stream flow during low-flow conditions. These watershed improvement projects will restore more days of recreational use than CSO controls alone.

Table 7-2 compares the estimated *E. coli* bacteria geometric mean for the pre-2002 conditions and the selected plan. CSO controls and watershed improvement projects are expected to make significant reductions in the *E. coli* bacteria geometric mean of all waterways. The city's water quality analysis determined that other sources of *E. coli* bacteria would prevent additional CSO controls from bringing waterways into compliance with the state's geometric mean standard of 125 cfu/100 mL.

Table 7-3 compares the estimated number of days each waterway would exceed the single sample standard of 235 cfu/100 mL for pre-2002 conditions and the selected plan. Although CSO controls and watershed improvements are expected to reduce the number of days over 235 cfu/100 mL, other bacteria sources are expected to prevent the waterways from attaining compliance with the state's TMDL criteria of no more than 36.5 days per year over 235 cfu/100 mL. It should be noted that for all waterways, the watershed improvement projects provide a greater reduction in the number of days over 235 cfu/100 mL than CSO controls. By implementing the watershed improvement projects, the city is expected to achieve more days of recreational use attainment, particularly during dry weather when people are more likely to be using the streams. Full recreational use attainment at all times during wet weather is currently prevented by high wet-weather stream flows, human-caused conditions and urban stormwater pollution that cannot all be remedied through additional CSO controls.

Although the city's analysis determined that CSO controls alone cannot reduce the number of days over 235 cfu/100 mL, CSO controls will reduce the frequency of very high levels of *E. coli* bacteria, such as 2,000, 5,000, or 10,000 cfu/100 mL. **Table 7-4** compares the estimated number of days each waterway would exceed 2,000 cfu/100 mL for the pre-2002 conditions and the selected plan. Eagle Creek and White River are expected to exceed 2,000 cfu/100 mL on a few additional days compared to other streams due to the *E. coli* bacteria received from stormwater.

7.5 Implementation Schedule

A 20-year schedule will allow the city to construct control measures in a planned and orderly manner; limit disturbance to neighborhoods; coordinate with other watershed improvement projects; accurately evaluate the effectiveness of each project; secure necessary rights of ways; coordinate technical, manpower and material needs; and manage the financial burden on ratepayers.

Table 7-2
Estimated *E. coli* Bacteria Impacts (Geometric Mean in cfu/100mL)

Watershed	Baseline Conditions	Selected LTCP
Fall Creek		
Without Watershed Improvements	361	201
With Watershed Improvements	361	148
Pogues Run		
Without Watershed Improvements	606	186
With Watershed Improvements	606	95
Pleasant Run		
Without Watershed Improvements	495	320
With Watershed Improvements	495	133
Eagle Creek		
Without Watershed Improvements	285	253
With Watershed Improvements	285	187
White River		
Without Watershed Improvements	466	212
With Watershed Improvements	466	172

Notes:
Indiana's monthly *E. coli* geometric mean standard is 125 cfu/100 mL.

Table 7-3
Estimated *E. coli* Bacteria Impacts (Days over 235 cfu/100 mL)

Watershed	Baseline Conditions	Selected LTCP
Fall Creek		
Without Watershed Improvements	188	170
With Watershed Improvements	188	134
Pogues Run		
Without Watershed Improvements	177	155
With Watershed Improvements	177	59
Pleasant Run		
Without Watershed Improvements	215	214
With Watershed Improvements	215	100
Eagle Creek		
Without Watershed Improvements	200	197
With Watershed Improvements	200	145
White River		
Without Watershed Improvements	178	157
With Watershed Improvements	178	135

Notes:
Indiana's TMDL criteria equals no more than 36.5 days per year over 235cfu/100mL.

Table 7-4
Estimated *E. coli* Bacteria Impacts (Days over 2,000 cfu/100 mL)

Watershed	Baseline Conditions	Selected LTCP
Fall Creek		
Without Watershed Improvements	63	3
With Watershed Improvements	63	2
Pogues Run		
Without Watershed Improvements	77	5
With Watershed Improvements	77	4
Pleasant Run		
Without Watershed Improvements	50	15
With Watershed Improvements	50	4
Eagle Creek		
Without Watershed Improvements	35	21
With Watershed Improvements	35	10
White River		
Without Watershed Improvements	69	9
With Watershed Improvements	69	7

The plan and implementation schedule will be reviewed every five years, as required by state law. This review will allow the city to incorporate new data, adopt new technologies that might become available and adapt the plan to fit changing circumstances or regulatory requirements.

The following sub-sections discuss the factors taken into consideration when the city developed the project schedule. As discussed in Section 6, the financial capability of citizens to pay for the program also was a significant concern in the rollout of the LTCP. If financial circumstances change or costs are higher than expected, the city may seek approval to extend the schedule.

7.5.1 Prioritization and Scheduling Criteria

Once the CSO control program and associated projects were selected, the city reviewed each project to determine both the project's priority and the sequence of construction. Criteria for prioritizing projects within each watershed were based on citizen concerns, advisory committee recommendations, and environmental concerns. In addition, the Indianapolis Clean Stream Team (ICST) added several additional criteria to incorporate concerns expressed by U.S. EPA and IDEM during LTCP discussions. The following criteria were used to develop the LTCP implementation schedule:

Construction Sequencing: The city reviewed all projects from a logical engineering and construction perspective to determine project relationships and develop the sequence in which the projects should be constructed. The city developed a project ranking based upon practical construction considerations, such as the need to construct downstream facilities prior to upstream facilities. All interdependent projects were ranked in order of their logical completion. In most tributaries, the city identified several projects that are independent of any other projects in that tributary. Several projects were moved ahead in the schedule to achieve an early level of CSO control. Completed and ongoing early action projects, such as the AWT plant expansions, also were incorporated into the schedule.

Tributary Priority: The tributaries were given a higher scheduling priority than White River. Independent projects that would benefit a tributary were ranked higher.

Contact with Public: The city placed the highest scheduling priority on areas where people, especially children, come in contact with a stream. This included placing the highest priority on stream segments along parks, wading areas used by children, and adjacent to school properties. The next priority was designated greenways, followed by stream segments adjacent to neighborhoods, followed by popular fishing holes. A number of early action projects were designed to address these areas.

Impacts Greatest Number of People: In determining where to start the work, the city selected the watershed where projects would have the most impact for the greatest number of people.

Water Quality Impacts: The city placed higher priority on projects that would provide the greatest water quality benefits. This is first measured by projects and actions that can restore beneficial uses and second by projects that can reduce pollutant load. For example, projects that would significantly reduce *E. coli* or prevent further depression of DO were ranked highest. Projects that would significantly reduce BOD, nitrogen series, phosphorous series, and algae or the projects that would benefit impaired biotic communities were also given higher priority.

Pollutant Load Reduction Priorities: The city placed higher priority on projects that would reduce overflows at significant BOD and TSS pollutant load contributor sites, including the Primary Effluent Bypass at the Belmont AWT plant.

Potential Toxicity: By applying the methodology described in Section 2 to characterize the theoretical potential for CSO impacts from significant industrial users, the city placed a higher priority on projects that would address those potential problems.

Concurrent Design and Construction: Where possible, the city sought to address sewage overflows on several fronts at once. For example, if the engineering and construction work necessary to address a heavily contaminated section of a stream is lengthy and involved, the city selected a project in another location that requires a less complicated solution to be constructed quickly, while pursuing planning and engineering on the more difficult section.

7.5.2 Implementation Steps

Based on these considerations, the city developed the total LTCP construction sequencing order and an implementation schedule for each project. The implementation schedule typically included the following steps:

Project Definition/Scoping: This step comprises the next activity following approval of the LTCP and includes developing additional definition of the project necessary for planning stage decisions to be made. At this stage, the approximate size and scope of the project and its location are defined.

Facility Planning/Pre-engineering: A facility plan is prepared, containing schematic layouts, sketches and preliminary design criteria. Examples of the facility planning process would include performing planning level geotechnical investigations and developing proposed alignments for the tunnels, setting bases for design, establishing system hydraulics, siting shafts, regulators and pumping stations, and other elements needed to define the functional needs and interaction of the system.

Design: This step consists of preparing designs and preparing contract documents (plans and specifications) to obtain bids for the project construction. Following completion of the design the project is advertised for bidding, bids are obtained and reviewed, the lowest responsive and responsible bidder is generally selected, a construction contract is awarded, and a notice to proceed is issued to the contractor indicating that work can begin.

Permits and Land Acquisition: During the design phase, necessary permits and approvals required for construction are obtained from various regulatory agencies. In addition, land is acquired as needed for rights of way or easements for project construction, operation, and maintenance.

Construction: This step includes building the facility in accordance with the design plans, specifications, contract documents, and actual field conditions. Construction oversight also occurs to ensure that plans and specifications are followed.

Startup/System Integration: Upon completion of testing and startup, the project construction is considered complete and the project is in operating order. After final cleanup and any outstanding issues such as land restoration, the city reviews the project to make certain that all specifications were followed, and then accepts the project and closes out the process. At this milestone, the facility is operational and is performing the function for which it is intended. Construction may extend beyond this milestone for items such as addressing claims arising during construction or warranty issues.

Public Outreach: Public outreach takes place at key points throughout this process, including facility planning, design and construction. Outreach is designed to communicate project goals and both short-term and long-term impacts, and to identify and address neighborhood concerns.

The team examined each project to estimate the amount of time that would be required to complete the key components. In some projects, the team determined that several engineering or construction periods could be conducted concurrently. Once the amount of time was allocated for each period, the times were summed to develop the total project design and construction period. Once all projects were sequenced, project interrelationships established, and project duration estimated, the city developed the final LTCP program implementation phasing schedule.

7.5.3 LTCP Program Implementation

Figure 7-15 shows the LTCP Program Implementation Phasing Schedule. The implementation schedule incorporates the city's ongoing early action projects (Phase 1) as well as long-term CSO control measures implemented in four phases over 20 years (Phase 2 through 5). Phase 1 is already complete and extended from 2000-2005, Phase 2 will extend from 2006-2010, Phase 3 from 2011-2015, Phase 4 from 2016-2020, and Phase 5 from 2021-December 2025.

Table 7-5 lists the LTCP control measures chronologically, and also includes design criteria, performance criteria and critical milestone dates for each project or group of projects. The LTCP consists of the following commitments:

- Implementing the CSO control measures listed in Table 7-5 according to the design criteria and performance criteria specified,
- Meeting the schedule for critical milestones established in Table 7-5, subject to a revision to water quality standards and the scheduling factors identified in Section 7.5.4 below, and
- Re-assessing the LTCP every five years to determine whether modifications to the control measures or schedule are warranted.

Upon full implementation, the CSO Control Measures listed in **Table 7-5** will still result in residual overflows during large storm events. Either a revision to Indiana's current water quality standards or some other legal mechanism is necessary to authorize those residual overflows. In Section 9 of the LTCP, the City of Indianapolis is requesting a revision to the applicable water quality criteria consistent with this level of control through the establishment of a CSO wet weather limited use subcategory supported by a Use Attainability Analysis (UAA). The design and construction of CSO Control Measures 1 through 14 ("Phase I" Projects) are not dependent upon the level of control that is ultimately determined, and therefore the city will implement CSO Control Measures 1 through 14 according to the terms and schedule set forth in **Table 7-5**. If the UAA process is not completed within five years, the city may seek a modification of the implementation schedule.

The following definitions were used in developing **Table 7-5**:

CSO Control Measures: CSO Control Measures are structural measures designed to reduce or mitigate the volume, frequency or pollutant levels in combined sewer overflows, consistent with the LTCP's 95 or 97 percent capture level of control.

Design Criteria: Design criteria are those criteria upon which the selected CSO control measures shall be designed to achieve the required level of control. (See footnotes 2 and 6 of Table 7-5). All selected LTCP projects will be designed in accordance with good engineering practices to ensure that corresponding facility-specific, watershed-wide and systemwide performance criteria will be achieved.

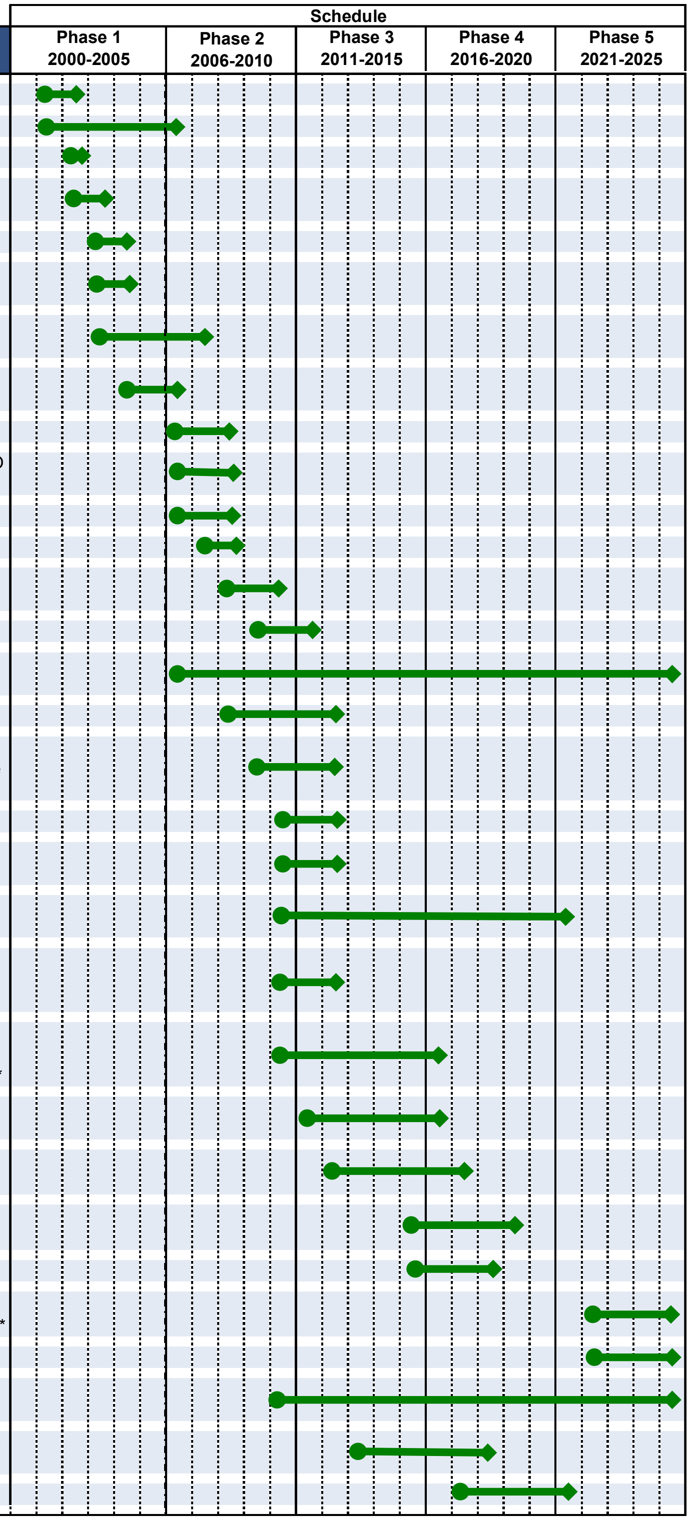
Performance Criteria: Performance criteria are those criteria used to assess the performance of CSO control facilities and improvements in water quality of receiving streams due to implementation of CSO control measures. These include any of the following: conveying the design flow rates, meeting any and all applicable permit requirements, and/or achieving the targeted percent capture and overflow frequency in a typical year.

Critical Milestone: Significant dates by which progress in implementing the LTCP will be tracked. For each major CSO Control Measure shown in **Table 7-5**, the Critical Milestones tracked will be Completion of Bidding Process and Achievement of Full Operation.

Completion of Bidding Process (Bid Year): The year by which: (1) Indianapolis has appropriately allocated funds for a specific CSO Control Measure (or portion thereof), (2) the bid for the specific CSO Measure has been accepted and awarded by the Department of Public Works Board for the construction of the CSO Control Measure, and (3) a notice to proceed has been issued and remains in effect.

Achievement of Full Operation: The completion of construction and installation of equipment or infrastructure such that the system has been placed in full operation, and is expected to both function and perform as designed, plus completion of shakedown and related activities, as well as completion of in-situ modified operations and maintenance manuals. This specifically includes all control systems and instrumentation necessary for normal operations and all residual handling systems. Certain specified CSO Control Measures set forth in Table 7-5 consist of separate components. For those specified CSO Control Measures, "Achievement of Full Operation" shall not be achieved until that last component is completed.

	CSO Control Measure (Significant Projects)
1	White River Screen at IUPUI (CSO 039)
2	Fall Creek Inflatable Dams (CSOs 063, 063A, and 065)
3	Modifications to Lift Station 507 at Riviera Club
4	Real-time Overflow Controls in Neighborhoods (CSOs 080, 084,118)
5	Pogues Run Inflatable Dam at Brookside Park (CSO 101)
6	White River East Bank Storage Tank at IUPUI/White River State Park
7	Belmont Advanced Wastewater Treatment Plant Improvements - Wet Weather Storage & Primary Clarifiers
8	Lower Pogues Run Improvements - Minimize Overflows near IPS Schools
9	Belmont AWT -- Gravity Belt Thickeners
10	Sewer Separation - White River and Thompson Road (CSO 275)
11	Sewer Separation - Lick Creek (CSO 235)
12	Real Time Overflow Control Study, Phase II
13	Rerouting of Overflows on Upper White River to Lift Station 507 at Riviera Club (CSO 205)
14	Riviera Club Improvements to Overflow Storage Tank
15	Fall Creek Tunnel, Collector Pipes and Watershed Projects**
16	Interplant Connection**
17	Belmont - Treatment for Wet-Weather Flows (Trickling Filters/Solids Contact: New aeration tanks and intermediate clarifiers)**
18	Lower Pogues Run Improvements - Continued **
19	Pogues Run - Sewer Separation at Forest Manor Park (CSO 143)**
20	White River Tunnel (Central Tunnel and Pump Station) and Watershed Projects**
21	Belmont AWT – Wet Weather Chlorination / Dechlorination** (Chlorine Disinfection Tank and Re-establish Existing Outfall)
22	Southport Advanced Wastewater Treatment Plant Improvements -- Air Nitrification System (ANS) Expansion**
23	Southport AWT Plant Improvements -- Wet Weather Disinfection**
24	Southport AWT Plant Improvements -- Primary Clarifier Expansion**
25	Belmont AWT -- Headworks and Grit Removal including Screens**
26	Southport AWT Plant Improvements -- Headworks**
27	Southport AWT Plant Improvements -- CSO Pump Station**
28	Southport AWT Plant Improvements -- EHRC Facility**
29	Pleasant Run Overflow Collector Pipe** (CSO Collector Pipe)
30	Eagle Creek Overflow Collector Pipe** (CSO Collector Pipe and Belmont West Cutoff)
31	Upper Pogues Run Improvements**



● *Completion of Bidding Process*

◆ *Achievement of Full Operation*

** **The city may, under certain circumstances, seek a modification of the schedule for CSO Control Measures 15-31 if the UAA process is not completed within five years.**

Figure 7-15
Program Phasing Implementation Schedule

Table 7-5
CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones

CSO Control Measure[1]		Description[2]	Design Criteria[2]	Performance Criteria	Critical Milestones[3]
1	White River Screen at IUPUI (CSO 039)	Horizontal screen with automatic clearing for removal of floatables	Provide instantaneous peak screening flow rate of 63 MGD	Capture most floatables greater than 4 mm in size	Bid Year – 2001 Achievement of Full Operation – 2002
2	Fall Creek Inflatable Dams (CSOs 063, 063A, and 065)[4]	Construction of three inflatable dams	Provide in-system storage capacity of approximately 4.6 MG	Consistent Operation[5]	Bid Year – 2001 Achievement of Full Operation – 2006
3	Modifications to Lift Station 507 at Riviera Club	Modifications to CSO 156 to take advantage of available storage volume in LS 507	Maximize in-system storage	Diversion of flow from CSO 156 to LS 507. When incorporated with the rest of the White River watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2002 Achievement of Full Operation – 2002
4	Real-time Overflow Controls in Neighborhoods (CSOs 080, 084,118)[4]	Construction of three inflatable dams	Provide in-system storage capacity of approximately 0.5 MG	Consistent Operation[5]	Bid Year – 2002 Achievement of Full Operation – 2003
5	Pogues Run Inflatable Dam at Brookside Park (CSO 101)[4]	Construction of one inflatable dam	Provide in-system storage capacity of approximately 0.4 MG	Consistent Operation[5]	Bid Year – 2003 Achievement of Full Operation – 2004
6	White River East Bank Storage Tank at IUPUI/White River State Park[4]	Overflow storage for CSO 039	Provide storage capacity of 3 MG	When incorporated with the rest of the White River watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2003 Achievement of Full Operation (CSO 39 Only) – 2004
7	Belmont Advanced Wastewater Treatment (AWT) Plant Improvements -- Wet-Weather Storage and Primary Clarifiers	Wet-weather storage basins (30 and 4 MG), two new primary clarifiers, and new process/yard piping	When incorporated with the rest of the Belmont Improvements, provide peak primary and biological treatment rate of 300 MGD	When incorporated with the rest of the Belmont improvements, facility complies with current NPDES permit	Bid Year – 2003 Achievement of Full Operation – 2007
8	Lower Pogues Run Improvements - Minimize Overflows near IPS Schools	Consolidation of outfalls 034 and 035 to Pogues Run Tunnel. Consolidation sewer is approximately 5200 feet of pipe	Provide approximate instantaneous peak flowrate of 40 MGD upstream. Provide approximate maximum instantaneous peak flowrate of 150 MGD downstream	When incorporated with the rest of the Pogues Run watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2004 Achievement of Full Operation – 2006
9	Belmont AWT -- Gravity Belt Thickeners	Installation of four gravity belt thickeners	Produce a thickened sludge concentration of 5% total solids (TS)	Reduction of sludge volumes and improved sludge dewatering operations.	Bid Year – 2006 Achievement of Full Operation – 2008
10	Sewer Separation - White River and Thompson Road (CSO 275)	Separation and rehabilitation of sewers to reduce stormwater flow and minimize CSO 275	Storm drains designed as per Indianapolis Stormwater Standards. Sanitary sewer designed as per Indianapolis Sanitary Standards and Ten State Standards	Separation of sewers to minimize CSO 275.	Bid Year – 2006 Achievement of Full Operation - 2008
11	Sewer Separation - Lick Creek (CSO 235)	Separation and rehabilitation of sewers to reduce storm water flow and minimize CSO 235	Storm drains designed as per Indianapolis Stormwater Standards. Sanitary sewer designed as per Indianapolis Sanitary Standards and Ten State Standards	Separation of sewers to minimize CSO 235.	Bid Year – 2006 Achievement of Full Operation - 2008
12	Real Time Overflow Control Study, Phase II	Develop next phase of RTC to further maximize the existing combined sewer system	Evaluate RTC for combined sewer system	Completed Study	Commence study – 2007 Complete study – 2008
13	Rerouting of Overflows on Upper White River to Lift Station 507 at Riviera Club (CSO 205)	Relocation of CSO 205 outfall to Lift Station 507. Includes rehabilitation of upstream sewers to eliminate clearwater infiltration	Provide approximate instantaneous peak flowrate of 25 MGD	When incorporated with the rest of the White River watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2008 Achievement of Full Operation – 2010

Table 7-5 - Continued
CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones

CSO Control Measure[1]		Description[2]	Design Criteria[2]	Performance Criteria	Critical Milestones[3]
14	Riviera Club Improvements to Overflow Storage Tank	Add wet-weather disinfection to existing satellite storage facility	Provide approximate instantaneous peak disinfection flow rate of 53 MGD	When incorporated with the rest of the White River watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2009 Achievement of Full Operation – 2011
15	Fall Creek Tunnel, Collector Pipes and Watershed Projects	Deep storage tunnel, consolidation sewers, elimination of CSO 103, dam removal, aeration[8]	Provide a storage volume of 110 MG	When incorporated with the rest of the Fall Creek watershed, achieve 97 percent capture and 2 overflow events[6]	Bid Year – 2006 Achievement of Full Operation - 2025
16	Interplant Connection	Interceptor originating near CSO 117 and terminating near the headworks of the Southport facility[8]	Peak diversion of 150 MGD CSO flow to Southport	Deliver flow from White River Tunnel to Southport AWT plant	Bid Year – 2008 Achievement of Full Operation – 2012
17	Belmont AWT - Wet-Weather Treatment (Trickling Filters/Solids Contact: New aeration tanks and intermediate clarifiers)	Provide secondary biological treatment of the Belmont PE Bypass	Provide parallel peak biological treatment rate of 150 MGD	When incorporated with the rest of the Belmont improvements, facility complies with current NPDES permit	Bid Year – 2009 Achievement of Full Operation - 2012
18	Lower Pogues Run Improvements - Continued	Conversion of existing Pogues Run Box into CSO storage facility ranging from 1.5 to 10 MG and interceptor	Diversion of CSO to White River Tunnel	When incorporated with the rest of the Pogues Run and White River watersheds, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2010 Achievement of Full Operation – 2012
19	Pogues Run - Sewer Separation at Forest Manor Park (CSO 143)	Sewer separation that minimizes CSO 143	Storm drains designed as per Indianapolis Stormwater Standards. Sanitary sewer designed as per Indianapolis Sanitary Standards and Ten State Standards	Separation of sewers to minimize CSO 143	Bid Year – 2010 Achievement of Full Operation – 2012
20	White River Tunnel (Central Tunnel and Pump Station) and Watershed Projects	Central tunnel and pump station, consolidation sewers, sewer separation, dam modifications, and aeration[8]	Provide storage volume of 114 MG	When incorporated with the rest of the White River watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2010 Achievement of Full Operation – 2021
21	Belmont AWT – Wet Weather Chlorination / Dechlorination (Chlorine Disinfection Tank and Re-establish Existing Outfall)	New wet-weather disinfection system and new discharge to White River	Additional peak disinfection treatment rate of 150 MGD	When incorporated with the rest of the Belmont improvements, facility complies with current NPDES permit	Bid Year – 2010 Achievement of Full Operation - 2012
22	Southport Advanced Wastewater Treatment Plant Improvements -- Air Nitrification System (ANS) Expansion	Expansion of ANS from 30 MGD to 150 MGD, fine bubble aeration, new blowers, new final clarifiers, and new process/yard piping	When incorporated with the rest of the Southport Improvements, provide total peak treatment rate of 300 MGD. Provide maximum pumping rate of 350 MGD	When incorporated with the rest of the Southport improvements, facility complies with current NPDES permit	Bid Year – 2010 Achievement of Full Operation - 2016
23	Southport Advanced Wastewater Treatment Plant Improvements -- Wet Weather Disinfection	New disinfection facility, pump station, 25 MG equalization basin with aerators, and new process/yard piping	When incorporated with the rest of the Southport Improvements, provide total peak treatment rate of 300 MGD. Provide maximum pumping rate of 350 MGD	When incorporated with the rest of the Southport improvements, facility complies with current NPDES permit	Bid Year – 2011 Achievement of Full Operation - 2016
24	Southport Advanced Wastewater Treatment Plant Improvements -- Primary Clarifier Expansion	Expansion of primary clarification facility, and new process/yard piping	When incorporated with the rest of the Southport Improvements, provide peak primary treatment capacity of 300 MGD. Provide maximum pumping rate of 350 MGD	When incorporated with the rest of the Southport improvements, facility complies with current NPDES permit	Bid Year – 2012 Achievement of Full Operation - 2017

Table 7-5 - Continued
CSO Control Measures, Design Criteria, Performance Criteria, and Critical Milestones

CSO Control Measure[1]		Description[2]	Design Criteria[2]	Performance Criteria	Critical Milestones[3]
25	Belmont Advanced Wastewater Treatment Plant Improvements -- Headworks and Grit Removal including Screens	Rehabilitation of the original headworks, new process/yard piping and supplemental disinfection from existing equalization basins	When incorporated with the rest of the Belmont Improvements, provide total peak primary and biological treatment rate of 300 MGD. Provide peak pumping rate of 450 MGD. Additional Disinfection of equalization outflow up to a peak rate of 150 MGD	When incorporated with the rest of the Belmont improvements, facility complies with current NPDES permit	Bid Year – 2015 Achievement of Full Operation – 2019
26	Southport Advanced Wastewater Treatment Plant Improvements -- Headworks	Expansion of headworks, screening, grit removal, and new process/yard piping	When incorporated with the rest of the Southport Improvements, provide total peak treatment rate of 300 MGD. Provide peak pumping rate of 350 MGD	When incorporated with the rest of the Southport improvements, facility complies with current NPDES permit	Bid Year – 2015 Achievement of Full Operation - 2018
27	Southport Advanced Wastewater Treatment Plant Improvements -- CSO Pump Station	New pump station for additional dewatering of captured CSO from the Interplant Connection	Additional 75 MGD for routing to Enhanced High Rate Clarifiers (EHRC)	When incorporated with the rest of the Southport improvements, facility complies with current NPDES permit	Bid Year – 2022 Achievement of Full Operation - 2025
28	Southport Advanced Wastewater Treatment Plant Improvements -- EHRC Facility[7]	New enhanced high rate clarifiers, and new process/yard piping	Additional 75 MGD EHRC treatment for dewatering of captured CSO from the Interplant Connection	When incorporated with the rest of the Southport improvements, facility complies with current NPDES permit	Bid Year – 2022 Achievement of Full Operation - 2025
29	Pleasant Run Overflow Collector Pipe (CSO Collector Pipe)	Collection interceptor and sewer separation. Collection interceptor is approximately 46,000 feet of pipe[8]	Provide approximate instantaneous peak flowrate of 125 MGD at the downstream end	When incorporated with the rest of the Pleasant Run watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2010 Achievement of Full Operation – 2025
30	Eagle Creek Overflow Collector Pipe (CSO Collector Pipe and Belmont West Cutoff)	Collection interceptor and relief interceptor. Collection interceptor and relief interceptor are approximately 40,000 feet of pipe[8]	Provide approximate instantaneous peak flowrate of 50 MGD at the downstream end	When incorporated with the rest of the Eagle Creek and White River watersheds, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2013 Achievement of Full Operation - 2018
31	Upper Pogues Run Improvements	Off-line storage facility, collection interceptor. Collection interceptor is approximately 9000 feet of pipe[8]	Provide approximate instantaneous peak flowrate of 65 MGD. Provide approximate storage volume of 9.5 MG	When incorporated with the rest of the Pogues Run watershed, achieve 95 percent capture and 4 overflow events[6]	Bid Year – 2017 Achievement of Full Operation – 2021

Footnotes:

[1] Upon full implementation, the CSO Control Measures listed in Table 7-5 are expected to result in 95 percent capture and 4 CSO events on the White River, Pleasant Run, Pogues Run and Eagle Creek and 97 percent capture and 2 CSO events on Fall Creek, as evaluated in accordance with footnote 6. Either a revision to Indiana's current water quality standards or some other legal mechanism is necessary to authorize overflows due to storms exceeding those levels of control. In Section 9 of the LTCP, the City of Indianapolis is requesting a revision to the applicable water quality criteria consistent with this level of control through the establishment of a CSO wet weather limited use subcategory supported by a Use Attainability Analysis ("UAA"). The design and construction of CSO Control Measures 1 through 14 ("Phase I" Projects) are not dependent upon the level of control ultimately determined, and therefore the city will implement CSO Control Measures 1 through 14 according to the terms and schedule set forth in this Table. IDEM and U.S. EPA acknowledge that the city is scheduled to start investing heavily in CSO Control Measures 15 through 31, which are level of control-dependent, in the years following approval of the city's LTCP. Accordingly, all parties intend that the UAA process be completed within five years from LTCP approval. If the UAA process is not completed within five years, IDEM and U.S. EPA agree that, under certain circumstances, the city can seek a modification of the implementation schedule.

[2] The Description and Design Criteria are based upon LTCP-level planning estimates and may be subject to revision during facility planning and design. One of the conditions of Descriptions and Design Criteria, applicable to all of the facilities set forth in this Table 7-5 is that the specific facility will be designed in accordance with good engineering practices to ensure that corresponding facility-specific, watershed-wide, and systemwide Performance Criteria will be achieved.

[3] The term "Bid Year" means "Completion of the Bidding Process."

(continued on page 7-37)

7.5.4 Scheduling Factors

Several financial, institutional, legal and technical factors will control the time required to implement the LTCP. This plan represents the largest single public works program ever undertaken in the City of Indianapolis. Based on the city's experience with early action projects, unforeseen circumstances will affect any strict schedule established for such a large and complex program in an urban environment, particularly when the work involves subsurface construction.

Time requirements in the implementation schedule have been based on information compiled during the planning process, experience with similar projects and estimates of future field conditions. During implementation, the city will need to identify and resolve any uncertainties and adjust the schedule accordingly. Additionally, changes in laws, requirements or regulations could require different time requirements than anticipated. Listed below are some of the principal criteria, standards, regulations, laws, guidelines and assumptions upon which the LTCP and schedule are based. Changes to any of the following may support a request for a modification of the LTCP and the implementation schedule:

1. The Clean Water Act, 1994 CSO Policy and U.S. EPA guidance for CSOs and for performing water quality standard reviews and revisions.
2. State of Indiana Water Quality Standards.
3. Indianapolis' NPDES permits.
4. Future judicial or administrative orders.
5. The financial capability of the City of Indianapolis and DPW remains equal to or better than that indicated in the financial capability assessment in the LTCP.
6. Indianapolis' bond rating is not lower than that indicated in the financial capability assessment in the LTCP and the interest rate for bonding is not higher than that indicated in the financial capability assessment.
7. All approvals, permits and land acquisitions can be obtained in the time frames shown in the implementation schedule.
8. Facility Planning: At this stage, the LTCP is a conceptual plan. Tunnel alignments, interceptor alignments and collection sewer alignments have not been selected, easements have not been obtained, facilities have not been sited fully, and so on. The facility plans will collect additional information (such as soil borings) and perform additional engineering (such as hydraulic design, functional design, system operational design, interaction and interface studies, configuration design, geotechnical investigations) necessary to develop the LTCP projects in more detail so phasing and preliminary designs can be prepared. Based on the results of the investigations and studies, the facility plan findings may require revision to time requirements and the project schedule. Subsequent changes in the findings of the facility plan may require additional modifications of the schedule.
9. Land is acquired or easements or rights to use the land are obtained from landowners, including the Indiana Department of Transportation (INDOT), Indy Parks and railroads, without unreasonable restrictions, for the following facilities:

   a. Fall Creek:

   i. Alignment for the Fall Creek Tunnel generally southwest along Fall Creek.

   ii. Alignment for the CSOs 216, 135, 141 and 066 collection sewer generally along Fall Creek Greenway.

   iii. Alignment for CSO 050 and 50A collection sewer generally along Fall Creek through Indy Parks' Watkins Park.

   iv. Rights to cross Tunnel under Interstate 65 and railroad (depending on route).

   v. Rights to align CSOs 126, 135, 141, and 066 collection sewer near railroad.

Table 7-5 Footnotes (continued)

[4] The CSO control measure is not expected to achieve 95 or 97 percent capture on its own and will work in conjunction with other CSO control measures at the specified CSO outfalls to achieve the performance criteria.
[5] Consistent Operation: Performs as designed on a regular basis. Failure to perform correctly is infrequent.
[6] CSO Control Measures will be designed to achieve Performance Criteria of 97 percent capture for the Fall Creek watershed and 95 percent capture for other CSO receiving waters, and 2 CSO events for the Fall Creek watershed and 4 CSO events for each of the other CSO receiving waters in a "typical year." "Typical year" performance, and achievement of Performance Criteria, shall be assessed in accordance with Section 8.4 (Post Construction Monitoring) using the average annual statistics generated by the collection system model for the representative five-year simulation period of 1996 to 2000 (or another five-year simulation period subsequently proposed by the city and approved by IDEM and U.S. EPA).
[7] The Southport EHRC facility will be constructed only if required to achieve the performance criteria for the Fall Creek and White River watersheds.
[8] The collection interceptor may be installed as multiple interceptors with the combined capacity as described in the Design Criteria.

b. Pogues Run:

i. Site for storage facility near Spades Park.

ii. Alignment for collection interceptor generally along Pogues Run starting near Forest Manor Park and running through Brookside Park and Spades Park.

iii. Alignment for sewer separation in CSO 143 basin.

iv. Rights to cross collection interceptor under railroad.

c. Pleasant Run:

i. Alignment for collection interceptor generally along Pleasant Run starting in Pleasant Run Golf Course and running through Pleasant Run Greenway, Ellenberger Park, Christian Park and Garfield Park.

ii. Alignment for collection interceptor generally along Bean Creek starting near Shelby Street and running through Garfield Park.

iii. Alignment for sewer separation in CSO 017 basin.

iv. Rights to cross Pleasant Run collection interceptor under railroad at three locations and align along cemetery.

d. Eagle Creek:

i. Alignment of collection interceptor generally along streets near Eagle Creek by Indy Parks' Golc soccer fields and Ross Claypool Park.

ii. Rights to cross collection interceptor under railroad at three locations and align along cemetery.

e. White River:

i. Alignment for collection sewer for CSO 205 generally along White River or canal.

ii. Site for CSO storage facility near Riviera Club lift station.

iii. Alignment for the central tunnel generally along White River through White River State Park and downtown Indianapolis.

iv. Site deep pumping facility near Bluff Road and Southern Avenue, near the Southwest Diversion Structure.

v. Rights to cross tunnel under Interstate 70 and railroad and along cemetery.

vi. Alignment of CSOs 043 and 044 collection sewer generally along White River near Bush Stadium over to the tunnel.

vii. Alignment of CSOs 045, 042, 041, 147 and 040 collection sewer generally along White River through Reverend Mozel Sanders Park and White River State Park.

viii. Alignment for sewer separation in CSO 046 basin.

ix. Rights to cross CSOs 043 and 044 collection sewer under railroad.

x. Rights to cross CSOs 045, 042, 041, 147 and 040 collection sewer under railroad.

10. INDOT, Indy Parks, railroads and other landowners allow temporary construction access, without unreasonable restrictions, to perform investigations, surveys, and to construct the facilities at locations as identified above.

11. The technical bases related to construction conditions and technology for construction of the CSO control facilities.

12. Plans of the state or federal governments that impact the siting, operation or other functional requirements of the CSO control facilities.

13. The actual costs of CSO control projects (based on construction bids or conditions encountered during construction) that significantly change the financial capability analysis.

14. Technical, legal and institutional conditions that require more time than anticipated or planned.

7.6 Summary

Following the assessment of the sewer system and CSO receiving waters, analysis of alternatives, gathering of public input, and analysis of financial capability, the City of Indianapolis has chosen a long-term control plan that reflects an affordable and attainable level of control. The plan restores attainable uses by providing cost-effective control of CSOs and protection of public health during recreational periods. A number of factors influenced the city's decision, including dry- and wet-weather realities of the city's system and receiving waters, regulatory requirements, public acceptance, affordability and cost-effectiveness. The city has concluded that the selected CSO Control Plan 1 (storage/ conveyance) at 97/95 percent capture represents the knee-of-the-curve for cost-effectiveness for a number of benefits, including percent capture and reducing high levels of *E. coli* bacteria in affected streams. The selected plan establishes a high level of CSO control and also seeks to control dry-weather sources of bacteria that limit recreational uses for substantial periods during the recreational season. Additional CSO control would not restore additional uses of the waterways.

The LTCP consists of the following commitments:

- Implementing the CSO control measures listed in Table 7-5 according to the design criteria and performance criteria specified,
- Meeting the schedule for critical milestones established in Table 7-5, and
- Re-assessing the LTCP every five years to determine whether modifications to the control measures or schedule should be sought.

Upon full implementation, the CSO Control Measures will still result in residual overflows during large storm events. Either a revision to Indiana's current water quality standards or some other legal mechanism is necessary to authorize those residual overflows. In Section 9 of the LTCP, the City of Indianapolis is requesting a revision to the applicable water quality criteria consistent with this level of control through the establishment of a CSO wet weather limited use subcategory supported by a Use Attainability Analysis (UAA).

The selected plan will employ storage/conveyance facilities in all major watersheds combined with treatment plant improvements. Flows from outfalls will be collected using conveyance facilities connected to a single deep tunnel. The deep tunnel will serve primarily as a storage facility, and the stored flows will be pumped out to the AWT facilities at the end of a storm event. The city will expand and upgrade its AWT facilities and build an interplant connection sewer to provide biological treatment of wet-weather flows. The plan also includes collection sewers and satellite underground storage facilities to control remotely located outfalls along upper White River and Pogues Run. The city will separate sewers along Lick Creek, State Ditch and other isolated outfall locations.

To achieve maximum benefits to public health and the environment, the city anticipates that it will implement programs to replace failing septic systems, meet state and federal stormwater management requirements, restore streambanks to more natural conditions, implement real-time flow controls within the sewer system, augment stream flow, and test improving oxygen levels through aeration in area streams. While these improvements are not a required component of the LTCP, are at the city's discretion and are not directly related to state or federal CSO control requirements, they show the city's willingness to consider going above and beyond requirements to improve water quality in neighborhood streams. The city will not be required to build or operate flow augmentation facilities if permitting authorities require higher treatment of AWT plant effluent prior to discharge to the smaller streams.

The selected plan will attain the dissolved oxygen aquatic life standard, restore attainable recreational uses, significantly reduce overflow frequency and pollutant loads, prevent CSO-caused exceedances of dissolved oxygen standards, reduce *E. coli* bacteria standard violations, control solids and floatables, and contain the first flush of sewage. The selected plan will significantly improve wet-weather ambient conditions for fish and other aquatic wildlife. By capturing the first flush and achieving 97 or 95 percent capture of CSO flows, the selected plan also will significantly reduce or eliminate odors, untreated sewage, and trash in neighborhood streams.

The program will be implemented in four five-year phases. A 20-year schedule will allow sufficient time to construct control measures in a planned and orderly manner; minimize disturbance to neighborhoods; accurately evaluate the effectiveness of each project; secure necessary rights of way; coordinate technical, manpower and material needs; as well as ease the financial burden on ratepayers.

This plan represents the largest single public works program ever undertaken in the City of Indianapolis. Based on the city's experience with early action projects, unforeseen circumstances will arise during construction, particularly when the work involves subsurface construction. During implementation, the city will need to identify and resolve any uncertainties and seek to adjust the schedule accordingly. Additionally, changes in laws, requirements or regulations could require different time requirements than anticipated.